Über dieses Buch

Dies ist ein digitales Exemplar eines Buches, das seit Generationen in den Regalen der Bibliotheken aufbewahrt wurde, bevor es von Google im Rahmen eines Projekts, mit dem die Bücher dieser Welt online verfügbar gemacht werden sollen, sorgfältig gescannt wurde.

Das Buch hat das Urheberrecht überdauert und kann nun öffentlich zugänglich gemacht werden. Ein öffentlich zugängliches Buch ist ein Buch, das niemals Urheberrechten unterlag oder bei dem die Schutzfrist des Urheberrechts abgelaufen ist. Ob ein Buch öffentlich zugänglich ist, kann von Land zu Land unterschiedlich sein. Öffentlich zugängliche Bücher sind unser Tor zur Vergangenheit und stellen ein geschichtliches, kulturelles und wissenschaftliches Vermögen dar, das häufig nur schwierig zu entdecken ist.

Gebrauchsspuren, Anmerkungen und andere Randbemerkungen, die im Originalband enthalten sind, finden sich auch in dieser Datei – eine Erinnerung an die lange Reise, die das Buch vom Verleger zu einer Bibliothek und weiter zu Ihnen hinter sich gebracht hat.

Nutzungsrichtlinien

Google ist stolz, mit Bibliotheken in partnerschaftlicher Zusammenarbeit öffentlich zugängliches Material zu digitalisieren und einer breiten Masse zugänglich zu machen. Öffentlich zugängliche Bücher gehören der Öffentlichkeit, und wir sind nur ihre Hüter. Nichtsdestotrotz ist diese Arbeit kostspielig. Um diese Ressource weiterhin zur Verfügung stellen zu können, haben wir Schritte unternommen, um den Missbrauch durch kommerzielle Parteien zu verhindern. Dazu gehören technische Einschränkungen für automatisierte Abfragen.

Wir bitten Sie um Einhaltung folgender Richtlinien:

+ *Nutzung der Dateien zu nichtkommerziellen Zwecken* Wir haben Google Buchsuche für Endanwender konzipiert und möchten, dass Sie diese Dateien nur für persönliche, nichtkommerzielle Zwecke verwenden.

+ *Keine automatisierten Abfragen* Senden Sie keine automatisierten Abfragen irgendwelcher Art an das Google-System. Wenn Sie Recherchen über maschinelle Übersetzung, optische Zeichenerkennung oder andere Bereiche durchführen, in denen der Zugang zu Text in großen Mengen nützlich ist, wenden Sie sich bitte an uns. Wir fördern die Nutzung des öffentlich zugänglichen Materials für diese Zwecke und können Ihnen unter Umständen helfen.

+ *Beibehaltung von Google-Markenelementen* Das "Wasserzeichen" von Google, das Sie in jeder Datei finden, ist wichtig zur Information über dieses Projekt und hilft den Anwendern weiteres Material über Google Buchsuche zu finden. Bitte entfernen Sie das Wasserzeichen nicht.

+ *Bewegen Sie sich innerhalb der Legalität* Unabhängig von Ihrem Verwendungszweck müssen Sie sich Ihrer Verantwortung bewusst sein, sicherzustellen, dass Ihre Nutzung legal ist. Gehen Sie nicht davon aus, dass ein Buch, das nach unserem Dafürhalten für Nutzer in den USA öffentlich zugänglich ist, auch für Nutzer in anderen Ländern öffentlich zugänglich ist. Ob ein Buch noch dem Urheberrecht unterliegt, ist von Land zu Land verschieden. Wir können keine Beratung leisten, ob eine bestimmte Nutzung eines bestimmten Buches gesetzlich zulässig ist. Gehen Sie nicht davon aus, dass das Erscheinen eines Buchs in Google Buchsuche bedeutet, dass es in jeder Form und überall auf der Welt verwendet werden kann. Eine Urheberrechtsverletzung kann schwerwiegende Folgen haben.

Über Google Buchsuche

Das Ziel von Google besteht darin, die weltweiten Informationen zu organisieren und allgemein nutzbar und zugänglich zu machen. Google Buchsuche hilft Lesern dabei, die Bücher dieser Welt zu entdecken, und unterstützt Autoren und Verleger dabei, neue Zielgruppen zu erreichen. Den gesamten Buchtext können Sie im Internet unter `http://books.google.com` durchsuchen.

This is a reproduction of a library book that was digitized by Google as part of an ongoing effort to preserve the information in books and make it universally accessible.

Google™ books

https://books.google.com

NYPL RESEARCH LIBRARIES
3 3433 00775170 8

Digitized by Google

Digitized by Google

Tramway
TPB

Digitized by Google

Digitized by Google

Digitized by Google

Digitized by Google

1918

THE TRAMWAY AND RAILWAY WORLD

AN ILLUSTRATED REVIEW OF PROGRESS IN ELECTRIC AND OTHER TRACTION

Established in 1892.

Index to Volume XLIV

July=December

1918

LONDON:
THE TRAMWAY AND RAILWAY WORLD PUBLISHING COMPANY, LIMITED,
AMBERLEY HOUSE, NORFOLK STREET.

Digitized by Google

853640

Digitized by Google

INDEX TO VOLUME XLIV

July—December, 1918.

ARTICLES MARKED THUS * ARE ILLUSTRATED.

PAGE

A

Act to Increase Statutory Charges 103
Aerial Traffic 348
Training Engineers for 348
Agricultural Development, Transport in Relation to 167
Albion Petrol Wagons* 43
Alcohol as Motor Fuel 315
Committee on 316
American War Vehicles 316
Anglo-Argentine Tramways Co., Annual Meeting 27
Area Transport Officers' Addresses 33
Army Motor Equipment 319
Association of British Motor and Allied Manufacturers 41, 125
Association of Motor Manufacturers 41
Ateliers de Construction Oerlikon Electric Locomotives* 85
Auctions of Motor Vehicles 315
Austin Lorries* 40,186
Australia, Standard Tramway Rail for .. 108
Automobile Association 125
Automobile Industry, Probable Effects of War on 255
Auto Trailer 253
Award to Tramway and Omnibus Workers 165, 358

B

Ballarat Tramways One-Man Car* 222
Birmingham Road Maintenance 259
Tramway Proposals 23
Blackpool Corporation Tramway Accounts .. 362
Tramways Unification 306
Board of Trade Electrical Trades Committee, Report of 19
Bradford Corporation Tramway Manager Resigns 104
New Manager Appointed 309
Bradford Parcel Rates 249
Brisbane Tramways, Government Purchase of 106
British Electrical and Allied Manufacturers Association 104
British Electric Traction Co. 26
British Motor and Allied Manufacturers Association 41, 125
British Scientific Products Exhibition.. .. 170
Buckinghamshire Base for Lorry Repairs 40, 180, 181, 370, 371

C

Canadian Tramway Advertising 171
Cattle Guard at Level Crossing* 294
Central Argentine Railway Electrification* 217, 283
Change Speed Gear, New 184
Channel Train Ferry* 346
Channel Tunnel, The 10
Charging Stations for Electric Vehicle .. 42
Chassis Stopping Test 41

PAGE

Chelmsford Corporation Arrangement with National Steam Car Co. 259
Cippenham Depot for Motor Repairs 40, 180, 181, 370, 371
Clarkson Motor* 115
Coal Conservation Committee Report .. 168
Coal Economy 88
Rationing 104
Restriction Order 100
Coal Saving Bonus Scheme of L.C.C. .. 305
Coke Burning Steam Car* 115
Collection of Used Tickets 30
"Commer" Cars, War Type Model* .. 43, 318
Commercial Motor Users Association .. 42, 43
Committee on Production, Tramway Workers Appeal to 165, 307
Compressed Gas for Omnibuses* 113, 120, 126
Compressed Gas Traction Committee 126
Sub-Committee 44
Tests 180
Conductor Rail* 294
Contracts and Orders .. 31, 108, 173, 248, 363
Control of Materials 355
Coventry Ordnance Works 360
Croydon Corporation Tramway Accounts .. 362

D

Damages for Personal Injuries 27
Decimal Coinage Commission 166
Dennis Bros., Guildford Works* 45
Post-War Output 42
Rail Tractor* 41
Designs for Third Rail Equipment* 342
Dick Kerr and Co., Annual Meeting .. 308, 360
Dick Kerr Petrol Electric Locomotives* .. 9
5,000 KW. Turbo-Alternator* 11
Ventilated Traction Motor* 160
District Railway Jubilee* 349
Electric and Steam Trains* 349
Mansion House Station* 350
Temple Station* 351
Don'ts for Drivers* 42
D.O.R.A. and Lights 359
Drivers' Age Limit Reduced 171
Championship 42
Rules 42
Dunlop Education and Endowment Schemes 43, 259
Dunlop Rubber Co., Chairmanship 43

E

Eastbourne Omnibuses Fuel 31
East Kent Traction Co., Long Distance Passengers 41
Economy Bonus for L.C.C. Car Crews .. 22
Edinburgh Gas Omnibus Costs 170
Edinburgh—Queensferry Tramway 171
Edinburgh Tramways Management 104
Tramways, Fares for 304

Digitized by Google

PAGE

Editorial 16, 92, 162, 224, 298, 352
Car Crews to aid Economy 94
Central Argentine Railway Electrification 298
Coal Economy 164
Economy in Coal Consumption 94
Efficient Driving 94
Electrical Enterprise in Reconstruction .. 17
Fares 16
Glasgow Tramway Finance 225
Housing and Tramways 92
Industrial League 226
London Police Restrictions 16
London Traffic Reform 162
London Tramways and Housing Requirements 299
Maximum Fares 16
Municipal Tramways Association .. 224
Railway Unification 352
Reconstruction in Electrical Enterprise 17
Select Committee on Transport 225
Sheffield's Goods Service 93
Trade after the War 92
Traffic Control at Street Junctions .. 164
Tramway Organisation 353
Transport Development 352
Transport, Select Committee on 225
Women's Wages 163
Eight Hour Day for Railwaymen 359
Electric Arc Welding* 158
Electric Locomotives of Swiss Federal Railways* 85
Electric Omnibuses for Rio Janeiro 124
Electric Power Supply Committee 22
Government Intentions 108
Post-War Position 231, 305
Electric Power Supply in Germany 91
Electric Railways 281, 283
Central Argentine* 217, 283
London and South-Western* .. 281, 282
Third Rail Design* 342
Track Equipment 341
Electric Tipping Wagon for South Shields .. 258
Electric Traction in the United Kingdom .. 20
Electric Tramways in Poland 161
Electric Vans for Dust Collection 257
Electric Vehicles, Economy of 184
Charging Stations for 42
Electric *v.* Petrol Machines 37
Electrical Enterprise in Reconstruction .. 17
Electrical Trades Committee's Report 19
Electrical Vehicle Committee 37
Endowment Scheme for Employees .. 43, 259
Engineering Trades Committee .. 38, 254
Engine Starters, Electric 315
Extraordinary Traffic 126

F

Fare Box for One-Man Cars* 223
Fares on Tramways 16
Act Increasing Statutory Charges .. 103
Bill to Increase Statutory Charges .. 18
Discussion on Statutory Charges 99
Report of Select Committee on 18
Financial Reports and Company Meetings 20, 26, 27, 29, 105, 172, 245, 307, 360, 361
First-Aid Instruction for Women Conductors . 127
Foreign Press Review 302
Four Wheel Drive 24
Fuel Shortage 171

PAGE

G

Gas Driven Omnibuses* 44, 113, 120, 126
Cost at Edinburgh 170
Safety of Drivers 180
General Election, Petrol for 371
Germany, Electric Power Supply in 91
Glasgow Corporation Garage 256
Glasgow Corporation Tramways Accounts 28, 245
Glasgow Parcels Service 309
Goods Traffic on Scottish Tramways 27
Government Motor Repair Depot 40, 180, 181, 370, 371
Government Road Control 183
Grants for Motor Omnibuses 44, 119
Statements in House of Commons 44

H

Halley Vehicles, Price of Second-hand .. 171
Handbook on Road Transport 370
Horse Fire Engine, London's Last 43
Housing and Traffic in the London Area .. 302
Hull Electricity Works and New Turbo-Alternator at* 11
Hydro-Electric Power Scheme 171

I

Improvement of Transportation 354
The Prime Minister's Programme 354
Industrial Reconstruction Lectures 107
Institution of Municipal and County Engineers 23
Italian Autocar Services 316

K

Keadby Bridge, Electrical Equipment of* .. 300
Kearney High Speed Railway 304
"Key" Industries Exhibition 249

L

Legal :—
Weston-super-Mare *v.* Butt and Co. .. 126
Licenses for Omnibuses 317
Light Railway Commission Continued .. 22
Light Railway Movements 167
Lights on Vehicles Unchanged 359
Liverpool Corporation Omnibuses 374
Load Factor on Tramways 14
Loading Platform* 46
London and South Western Railway abolish Second Class 104
Success of Electrification* 281
London Area Housing Problem 302
London County Council
Coal Saving Bonus Scheme .. 22, 305
Housing and Traffic 302
Tramway Estimates, 1918-19 28
London Fire Brigade Motors 43
London General Omnibus Co., Compressed Gas Tractors* 120
London Police Regulations 16
London School of Economics 171
London United Tramways 303
Lorry Repair Base 40
Lorry Wheels 24
Luxury Tax, The 254

M

Maintenance of Motor Omnibuses 372
Marylebone Council's Austin Lorry Fleet* .. 186
Maudslay Lorry in Belfast* 258
Maxima Fares Bill 16
Metropolitan Police Restrictions 16

Digitized by Google

PAGE

Montreal Tramways Advertising Campaign .. 171
Motor Cab Mileage per Gallon 181
Motor Equipment for War 319
Motor Exhibitions 373
Industry Branch Committee 41
Motor Industry Honours 44
Motor Manufacturers' Association 41
Motor Omnibuses at Chelmsford 259
Morecambe 125
Sheffield 125
Todmorden 183
Motor Omnibus Grants 44
Motor Omnibus Maintenance 372
Motor Section .. 37, 113, 179, 253, 315, 369
Motor Traction Development 167
Motor Traffic in Victoria 128
Motor Traffic Notes 45, 128, 186, 260, 320, 374

MOTOR TRAFFIC SECTION
Albion Petrol Wagons* 43
Alcohol as Motor Fuel 315, 316
American War Vehicles 316
Army Motor Equipment 319
Association of British Motor and Allied Manufacturers 41, 125
Auctions of Motor Vehicles .. 315
Austin Lorries, Marylebone Council's Fleet of* 186
Austin Lorries, Motors for Refuse Collection 40
Automobile Association 125
Automobile Industry, Influence of War on 255
Auto Trailer 253
Birmingham Road Maintenance 259
British Motor and Allied Manufacturers 41, 125
Change Speed Gear, A New 184
Charging Stations for Electric Vehicles .. 42
Chassis Stopping Test 41
Chelmsford Corporation and Omnibus Service 259
Chester's Electric Wagons 184
Cippenham Depot for Motor Repair 40, 180, 181, 370, 371
Clarkson Motor* 115
Coke Burning Steam Car* 115
"Commer" Car, War Type* 318
Commercial Motor Users Association 42, 43
Commercial Cars* 43
Compressed Gas for Omnibuses .. 113, 120, 126
Gas Traction Committee 126
Tests of Sub-committee on Safety for Drivers 44, 180
Dennis Bros' Guildford Works* 45
Post-War Output 42
Rail Tractor* 41
Don'ts for Drivers* 42
Drivers' Championship 42
Drivers' Rules 42
Dunlop Education and Endowment Schemes 43, 259
Dunlop Rubber Co., Chairmanship .. 43
East Kent Traction Co., Long Distance Passengers 41
Economy of Electric Vehicles 184
Edinburgh Gas Omnibus Costs 170
Electric Omnibuses for Rio Janeiro .. 124
Electric Tipping Wagon for South Shields 258
Electric Vans for Dust Collection .. 257
Electric Vehicle Charging Stations .. 42

PAGE

Electrical Vehicle Committee 37
Electric Vehicles, Economy of .. 37, 184
Endowment Scheme for Employees 43, 259
Engineering Trades Committee .. 38, 254
Engine Starters 315
European Motor Car Census 183
Extraordinary Traffic 126
First Aid Instruction for Women Conductors 127
Four Wheel Drive 24
Gas Motor Drivers, Safety for 180
Gas Driven Omnibus* .. 44, 113, 120, 126
General Election, Petrol for 371
Glasgow Corporation Garage 256
Glasgow, Electric Vehicles at 184
Government Motor Repair Depot 40, 180, 181, 370, 371
Government Road Control 183
Grants for London Motor Omnibuses 44, 119
Statements in House of Commons .. 44
Halley Vehicles, Price of Second-hand .. 171
Handbook on Road Transport 370
Horse Fire Engine, London's Last .. 43
Italian Autocar Services 316
Licenses for Omnibuses 317
Liverpool Corporation Motor Omnibuses 374
Loading Platform* 46
London Fire Brigade Motors 43
London General Omnibus Co., Compressed Gas Tractor* 120
Lorry Repair Base 40
Luxury Tax, The 254
Maintenance of Motor Omnibuses .. 372
Marylebone Council's Austin Lorry Fleet* 186
Maudslay Lorries* 258
Morecambe Municipal Omnibuses .. 125
Motor Cab Mileage per Gallon 181
Motor Exhibitions 373
Motor Industry Branch Committee .. 41
Motor Industry Honours 44
Motor Manufacturers' Association .. 41
Motor Omnibuses for Todmorden .. 183
Grants 44
Maintenance 372
Motor Traffic in Victoria 128
Motor Traffic Notes 45, 128, 186, 260, 320, 374
Motor Transport Volunteer Corps .. 125
Motor Truck Stopping Tests 41
Motor Van with Sleeping Berth* .. 185
Motor Vehicles, Disposal of Surplus .. 369
Motor Vehicles for Civilian Work .. 369
Improvements in 369
Sales 315, 369
Motor Vehicles for Municipalities 45, 127, 185, 259, 318, 374
Municipal and County Engineers .. 23
Municipal Omnibus Extensions 125
Napier Lorry in Railway Service* .. 183
Vans* 319
War Service* 259, 260, 319
National Roads 114
Natural Gas for Motor Cars 43
Newcastle Miners' Omnibus* 127
Omnibus Selection by Tests* 39
Petrol, Military Conviction Quashed .. 318
Restrictions Relaxed 371
Supply in United States 317
Post-War Improvements in Motor Vehicles 369

Digitized by Google

MOTOR TRAFFIC SECTION—*continued.* PAGE

Precedence among Passengers 41
Prize for Coal-Gas Motor Invention .. 114
Protection for the Motor Industry .. 113
Rail Tractor at Guildford* 41
Registration of Transport Vehicles .. 40
Research Work in the Motor Industry .. 254
Rio Janeiro Omnibuses 124
Road and the Vehicle 179
Road Board, Annual Report of 258
Road Control by Government 183
Road Improvement and Taxation .. 370
Road Maintenance after the War .. 24
Road Repairs, Liability for 126
Road Train, The 253
Road Transport Board Handbook .. 370
Road Transport Boards 185
Road Washing Vehicles* 181
Rubber Tires Standardization 372
Safety First Propaganda* 42
Safety Hints for Gas Motor Drivers .. 180
Safety League Rules 42
San Francisco Omnibuses* 39
Saving in Transport Costs 38
Saw Tooth Loading Platform* 46
Second-hand Motor Prices .. 171, 185
Service Lorries for Disposal 305
Sheffield Municipal Omnibuses 125
Sleeping Berth in Motor Vans* 185
Slough Repair Depot 40
War Office Scheme Approved 180, 181, 370, 371
South American Motor Market 182
Standardization 114
Starters, Electric Engine 315
Steam Wagons and Fuel Economy .. 372
Steam Wagon Manual 318
Steam Wagon as Omnibus at Newcastle* 127
Steering Rod, Latent Flaw in 257
Straker Squire Vehicles* 128
Road Washing Vehicle* 181
Surplus Motor Vehicles 369
Tar Spraying Restriction 127
Tests of Omnibuses at San Francisco* .. 39
Thornycroft Steam Wagon* 373
Vehicles in War Service* 373
Tilling-Stevens Vehicles* 184
Todmorden Omnibuses 183
Tower-Wagon with Pneumatic Tires .. 319
Tractor and Two-Wheeled Trailer .. 253
Trailer Regulations Needed 254
Trailers for Motor Vehicles .. 253, 254
Transport Costs, Saving in 38
Transport Inquiry asked for 38
Transport Vehicles Registration 40
Trench Pumping* 257
Triplex Safety Glass* 182
Walsall Omnibus Licenses 317
War Effects on Motor Industry 255
War Motor Equipment 319
War Vehicles, American 316
Weston-super-Mare U.D.C. *v.* Butt and Company 126
White Omnibus Specification* 39
Wolseley Scholarship 254
Women's Wages at Bradford 125
Motor Transport Volunteer Corps 125
Motor Truck Stopping Tests 41
Motor Van with Sleeping Berth* 185

PAGE

Motor Vehicles for Civilian Work 36
Disposal of Surplus 315, 369
Improvements 369
Motor Vehicles for Municipalities 45, 127, 185, 259, 318, 374
Morecambe Municipal Omnibuses 125
Municipal and County Engineers 23
Municipal Omnibus Extensions 125
Municipal Tramways Association
Annual Meeting at Leicester 227
Presidential Address (Ald. S. Flint) .. 230
Post-War Position of Electric Power Supply (E. Hatton). .. 231, 305
Meeting of Managers' Section 238
Telegram from the President of the Board of Trade 237
Annual General Meeting 239
National Joint Council 237
Report of Executive Council .. 238, 242
Presentation to Mr. C. J. Spencer .. 240
New President (T. B. Goodyer) .. 245

N

Napier Vans* 259, 260
Lorries in Railway Service* 183
Lorries in War Service* 319
National Awards: the 20*s.* Bonus and the 12½% Advance 96
National Joint Council for the Tramway Industry 98, 237
National Roads 114
Natural Gas for Motor Cars 43
Newcastle Miners' Omnibus* 127
New South Wales Railways and Tramways .. 25
Railway Rolling Stock 25
Steel Tires 25
Nottingham Corporation Standard Tramway Car* 155

O

Omnibus Selection by Tests* 39
Omnibus Workers, Award to 358
One Man Car in Australia* 222

P

Parcel Carrying at Glasgow 309
Patent List 32, 108, 175, 248, 311, 365
Pernambuco Tramways Co. 25
Personal Injuries, Damages for 27
Personal 30, 44, 107, 173, 246, 309, 363
Personal Items 44
Petrol Electric Locomotives* 9
Military Conviction Quashed 318
Petroleum Committee 316
Petrol Restrictions Relaxed 371
Petrol Supply in the United States 317
Poland Tramways 161
Post-War Improvements in Motor Vehicles 369
Power Supply and Electrical Trades 15
Precedence among Passengers 41
Presentations to Mr. C. J. Spencer .. 240, 309
Prize for Coal-Gas Motor Invention 114
Protection for the Motor Industry 113

Queues, Tramway 159
London Omnibus 170

Digitized by Google

PAGE

R

Rail Joints and Corrugation 89
Rail Tractor at Guildford* 41
Railless Traction 351
Railway Men's Wages 171
Eight Hour Day 359
Railway Unification 355
Reading Corporation Tramways Report .. 308
Reconstruction in Electrical Enterprise .. 17
Registration of Transport Vehicles 40
Regulation of American Street Railways .. 174
Reinforced Concrete Goods Car 305
Repair Shops and Stores Lost in France .. 40
Research Work for Motor Industry 254
Richborough—Calais Train Ferry* 346
Rio Janeiro Omnibuses 124
Road Board, Annual Report 258
Road Control by Government 183
Handbook 370
Improvements and Taxation 370
Maintenance after the War 24
Road Repairs, Liability for 126
Road and the Vehicle, The 179
Road Train, The 253
Road Transport Boards 185
Road Transport Order 31
Road Washing Vehicle* 181
Rubber Tires, Standardization of 372

S

Safety First in Industry 18, 42, 297
In Darkened Streets 166
Poster 248
Propaganda* 42
Safety Hints for Gas Motor Drivers 180
Safety League Rules 42
San Francisco Omnibuses* 39
Saving in Transport Costs 38
Saw-Tooth Loading Platform* 46
Second Class on L.&S.W. Rly. Abolished .. 104
Second-hand Motor Prices 171, 185
Select Committee on Fares 18
Select Committee on Transport .. 223, 356
Service Lorries for Disposal 305
Shanghai Tramway "Tank"* 223
Sheffield Corporation Requires Tramway Cars 374
Sheffield Municipal Omnibuses 125
Siemens Bros. & Co. Meeting 26
Single-Phase Locomotives of Swiss Federal Railways* 85
Slack Hour Shopping and Fuel 171
Sleeping Berth in Motor Vans* 185
Slough Repair Depot .. 40, 180, 181, 370
South American Motor Market 439
Southampton—Dieppe Train Ferry* 821
Staff Efficiency Meetings 305
Standard Car at Nottingham* 155
Standardization 114
Standardization of Electric Track Equipment 341
Standard Tramway Rail for Australia .. 108
Starters, Electric Engine 315
Statutory Charges Bill, Text of 18
Statutory Undertakings (Temporary Increase of Charges Act, 1918 103
Steam Wagon as Omnibus* 127
Economy of Fuel 372
Manual of 318
Steering Rod, Flaw in 257

PAGE

Straker Squire Vehicles* 128
Road Washing Vehicle* 181
Street Railways in the United States, Regulation of 174
Strike of Women Employees 165
Strikes on Tube Railways 166
Surplus Motor Vehicles, Disposal of .. 315, 369

T

Tank on Shanghai Tramways* 223
Taylor *v.* Dumbarton Burgh and County Tramways Co. 27
Tar Spraying Restriction 127
Testing Departments for Electric Railways .. 171
Tests of Omnibuses at San Francisco* .. 39
Thermit, Ltd. 25
Third Rail Design* 295, 342
Thornycroft Steam Wagon* 373
Three Years of Electric Traction on L. and S.W. Railway* 281
Tilling Stevens' Vehicles* 184
Todmorden Omnibuses 183
Tower Wagon with Pneumatic Tires .. 319
Track Maintenance and Electric Arc Welding* 158
Tractor and Two-Wheeled Trailer 253
Trade after the War 15
Traffic Returns 34, 110, 176, 250, 312, 366
Trailer Regulations Needed 254
Trailers for Motor Vehicles 253, 254
Train Ferry across the Channel* 346
Tramway and Light Railway Notes 31, 107, 174, 247, 310, 364
Aberdare 247
Aberdeen 107
Banff 247
Bexley 174
Birmingham 31, 247, 364
Bournemouth 31
Bradford 107, 247, 310
Burnley 364
Burton-on-Trent 174
Colchester 174
Coventry 310
Croydon 107, 174
Darlington 107
Dewsbury 174, 247
Doncaster 107
Dublin 31, 247, 310, 364
Dundee 310, 364
Edinburgh 31, 174, 247, 310
Falkirk 364
Gateshead 107
Glasgow 31, 107, 247, 310, 364
Hanley 107
Hull 107, 174
Keighley 174
Leeds 107, 174, 310, 364
Leicester 31
Liverpool 32, 107, 174
Llandudno 174
London 32, 108, 174
Manchester 32, 364
Mansfield 108
Middlesbrough 248
Newcastle-on-Tyne 310
Newport 174
Nottingham 32, 248
Paisley 248

Digitized by Google

Tramway and Light Rly. Notes—*continued.* PAGE

Plymouth 32, 174
Poole 248
Portsmouth 310
Rhondda 174
Rotherham 108
Scarborough 108, 174
Sheffield 32, 108, 248, 310
South Shields 364
St. Helens 310
Swansea 174
Tynemouth 248
Wigan 310
Wolverhampton 174
Worcester 248
Wrexham 310
Yarmouth 174
York 364
Tramway and Omnibus Workers' Claims 307, 358
Tramway and Omnibus Workers' Wages 103, 165, 358
Award by Committee of Production .. 165
Tramway Chairman for 1918-19 359
Tramway Load Factor 14
Tramway Repair Troubles 296
Tramways and Light Railways Association
Annual Congress 95
Annual Dinner 102
Coal Restriction Order 100
Increased Fares 99
National Awards 96
National Industrial Councils 98
Sir Arthur Stanley's Address 95
Transport Committee 223, 356
Transport Costs, Saving in 38
Transport in Relation to Agricultural Development 167
Transport Inquiry Asked for 38
Transport Officers' Addresses 33
Transport, Report of Select Committee on 223, 356
Transport Vehicles, Registration of 40
Transportation, Improvement of 354
Trench Pumping* 257
Triplex Safety Glass* 182, 358
Tube Railways Strike 166
Turbine Plant at Hull* 11

U

Underground and L.G.O. Co. Staff Efficiency Meeting 305
Universal Fare Suggestion for Edinburgh .. 304
Used Tickets, Collection of 30

W

Wages, Awards to Tramway and Omnibus Workers 103, 165, 358
Railway Men's 171
Walsall Omnibus Licenses 317
War Effects on Motor Industry 255
Weston-super-Mare U.D.C. *v.* Butt and Co .. 126
White Omnibus Specification* 39
Whitley Councils 237
Wolseley Scholarship 254
Women Conductors in New York 171
Women Employees Strike 165
Women's Wages 125, 166
Woods-Gilbert Rail Remodelling Company .. 173
Worn Rails Built up 25

PERSONAL REFERENCES AND AUTHORS' INDEX.

Addison, Dr. 355
Barham, G. Basil 297
Bond, Walter 259
Blain, H. E. 351
Blake, W. E. 351
Brodie, John 24
Brown, Albert 126
Campbell, A. H. 23, 305
Cant, R. M. 258
Capone, E. 342
Clough, W.* 241
Cockrill, J. W. 23
Curwen, M. E. 309
Davidge, W. R. 24
Dryland, A. 24
du Cros, Sir Arthur, M.P. 43
Dudgeon, H. M. 89
Fisher, Rt. Hon. W. Hayes 23
Flint, Ald., S.* 230, 245
Furness, Chas. 306
George, The Rt. Hon. Lloyd* 354
Gibb, Sir George 24
Goodyer, T. B.* 239
Gurney, Arthur, E. 161
Hatton, E.* 231, 233, 237
Hayward, T. W. A 23
Jenkins, D. M. 23
Magoris, J. F. 11
Manville, Edward 125
McColl, Donald 223
McElroy, J. M. 233
Merz and McLellan, Messrs. 217
Murray, W. 235
Pilcher, R. Stuart 104
Pringle, P. T. 222
Rayner, E. S. 14, 235
Remington, A. A. 255
Shave, G. J. 126
Spencer, C. J. 104, 240, 309
Stanley, Sir Albert 237
Stewart, C. L. E. 236
Stilgoe, H. E. 23
Stokes, H. P. 234
Stubbings, G. W. 297
Studer, Hugo 85
Webber, H. 234
Wilkinson, R. H. 235, 309

Q241 The Bololph Printing Works, 8, Gate Street, Kingsway, W.C.2.

Digitized by Google

Irregular paging throughout

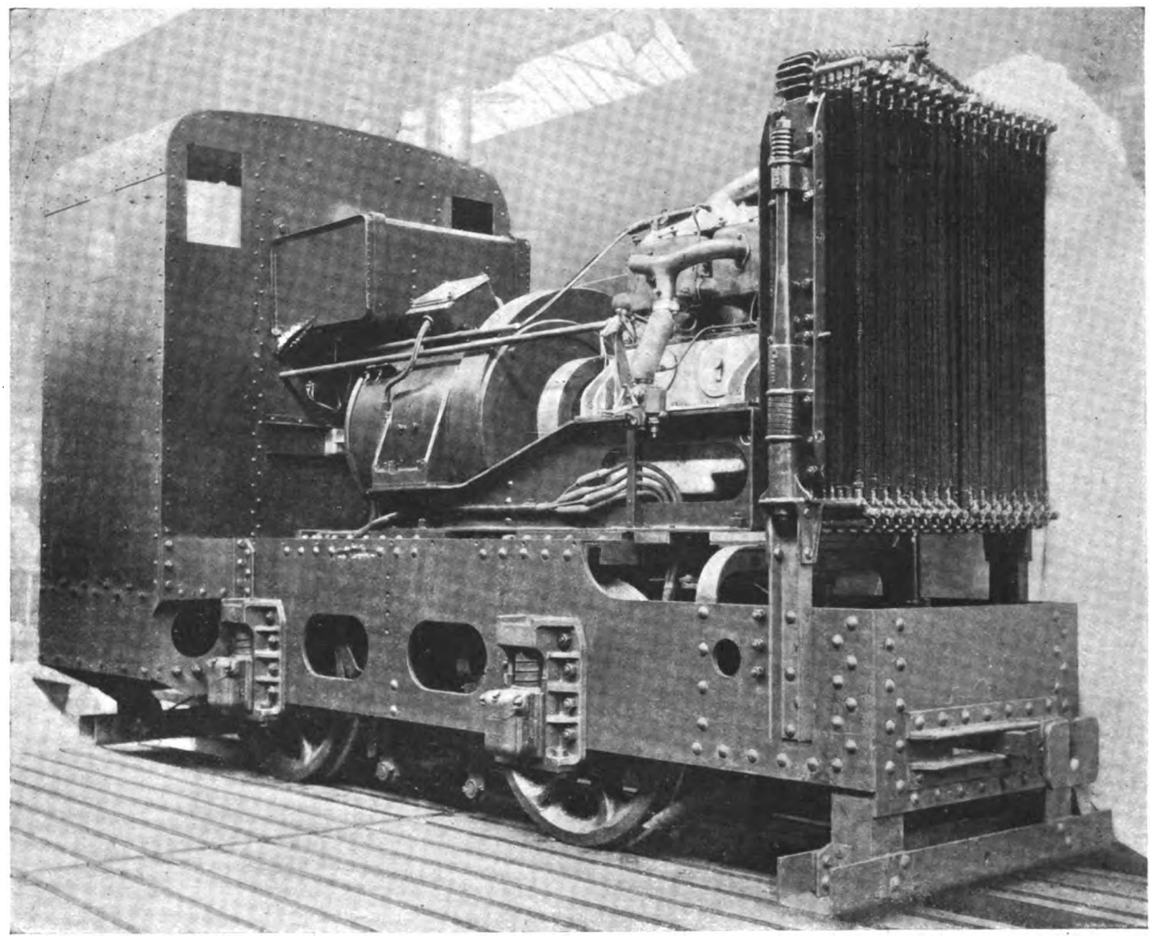
THE Tramway & Railway World
WITH MOTOR TRAFFIC SECTION

Founded 1892. LONDON, JULY 11, 1918. VOL. XLIV.

SOME NOVEL DICK-KERR LOCOMOTIVES.

PETROL ELECTRIC MOTORS FOR SIXTY CENTIMETRE RAILWAYS.

Within the last few years Messrs. Dick, Kerr and Company have constructed for service abroad over one hundred petrol electric locomotives, which have given excellent results. These interesting and novel machines, which are illustrated in the accompanying series of photographs, are designed to haul 100 tons on the level, and are built to run on a 60-centimetre gauge railway. They have an over-all length of 15 ft. 1 in., and an extreme width over the cab of 5 ft. 6 in., with a height of about 8 ft. 6 in. The weight is 7 tons each. The superstructure, including the driver's cab, housing for the generating plant, petrol tank, radiator, etc., is carried on a rivetted frame built up of ½-in. boiler plate. At each end there is a re-railing bar, which is placed across the truck and suspended just above the rails. These bars, in case of derailment, hold the locomotive in position, and facilitate its replacement by means of re-railing levers and lifting jacks provided for the purpose. Combined buffers and couplings are provided at each end of the truck, and there is sanding gear to each wheel. The brake gear is of the equalised type. A special tackle with eyes for crane hooks is provided over the housing, so that the locomotive may be conveniently handled for shipment.



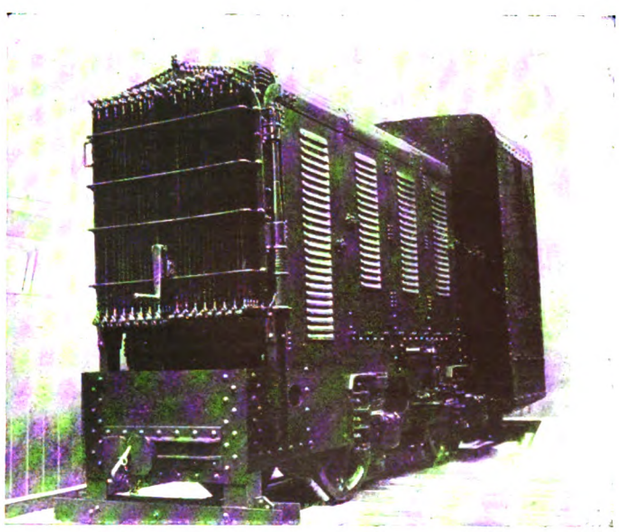
Petrol Electric Locomotive with Housing Removed, Showing Radiator, Petrol Engine, and Generator.

Each locomotive is provided with a 45-H.P. four-cylinder petrol engine, which drives through a flexible

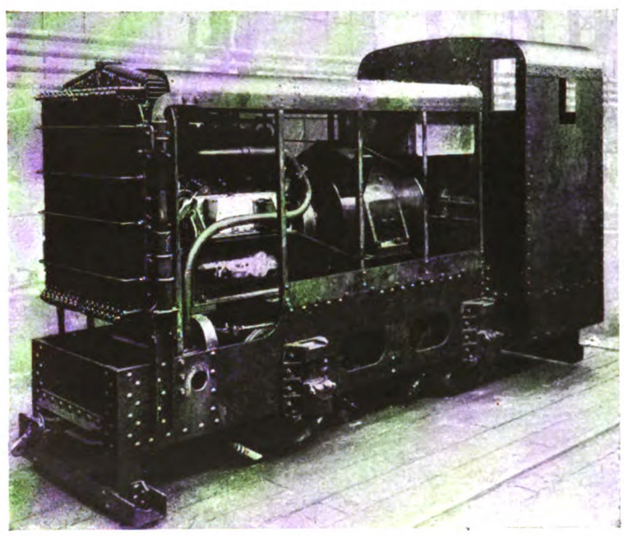
Digitized by Google

coupling a 30-KW. ventilated type direct-current generator. This generating set runs at 1,000 revolutions per minute, and supplies current at 500 volts pressure to two D-K 21 mining type traction motors, each driving through single reduction gearing of 6·68 to 1 ratio on to an axle with 32-in. wheels. The motors each have a continuous rating of 12 H.P., and an hourly rating of 25 H.P., and allow of a locomotive speed of 5·2 miles per hour on the one hour rating.

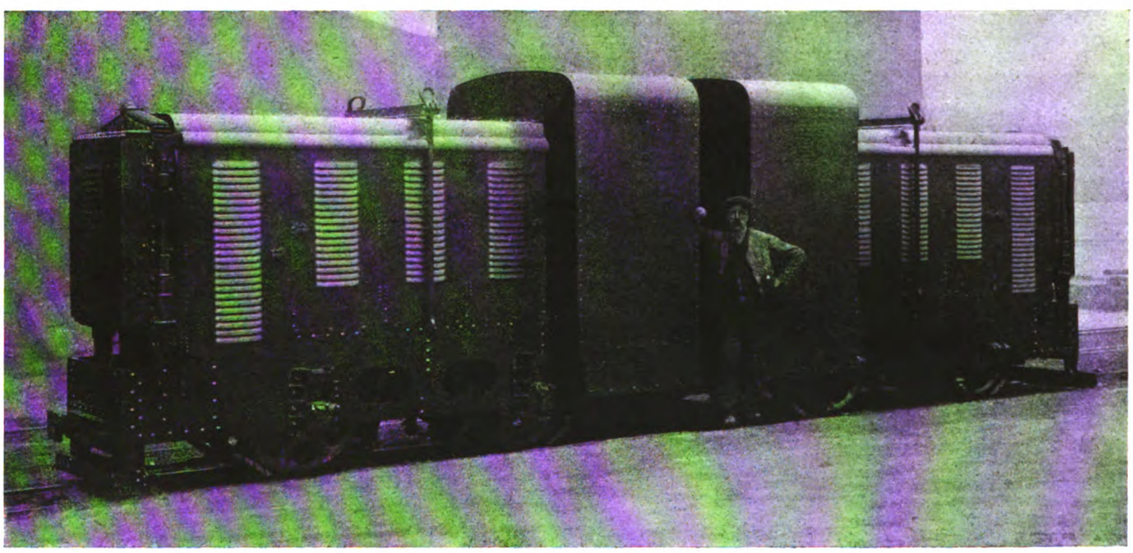
The two motors are run in parallel, speed control being obtained by varying the generator voltage, a special type of controller being employed in which provision is made for cutting out either motor in case of a breakdown, and in which special notches are provided for starting the engine by means of electric current supplied from another locomotive. The controller is mounted in the cab close to the control levers for the ignition and throttle. The cab also contains a starting handle, the hand wheel pillar for the brakes, circuit breakers and instruments, including a revolution counter. The petrol tank is carried under the housing immediately in front of the cab, and means are provided for filling it from inside the latter.



Petrol Electric Locomotive Encased with Steel.



Locomotive Ready for Steel Side Panels.



A Pair of Dick-Kerr Petrol Electric Locomotives on the Track (Gauge 1 ft. 11½ in.).

THE CHANNEL TUNNEL.

Sir Arthur Fell, chairman of the House of Commons Channel Tunnel Committee, in speaking at the Inter-Allied Parliamentary Commercial Conference on July 4, said that the effect of the proposed tunnel would be tremendous. The effect of a sea voyage on the goods traffic between Great Britain and the Continent generally was even more serious than the effect on passenger travel. Goods had to be packed substantially the same as for a voyage to New York or Australia, while the freight charges were often less to New York than across the Channel. Many products could not stand the sea voyage from France, and other consignments were unable to bear the expense and delay of two transhipments. To accommodate European express trains the diameter of the tunnel would be 18 feet, and the cover above the tunnel would be 100 feet, thus protecting it against mines, while provision would be made in case of emergency to flood it with water for a length of a mile. Electric expresses would run direct from London to Paris in less than six hours.

Digitized by Google

NEW TURBINE PLANT AT HULL.

A 5,000-KW. STANDARD DICK-KERR IMPULSE MACHINE.

In view of the growing demand for electrical power for local industries the Hull Corporation, on the advice of its engineer, in 1911 embarked on a comprehensive scheme for three-phase supply to augment the existing high tension and low tension direct current system. This scheme included the installation of three-phase turbo-generating plant, serving several sub-stations through a system of ring mains, and the initial stages were completed at the latter end of 1913.

To contain the new plant, reinforced concrete turbine and boiler houses were constructed, adjoining the older station; the former was designed to accommodate four 2,000-KW. sets and can be considerably extended when required. The first installation of generating plant comprised two Dick-Kerr turbo-alternators with an output of 2,000 KW. at ·8 power factor, when running at 1,500 revolutions per minute, to supply three-phase current at 6,600 volts and 50 cycles.

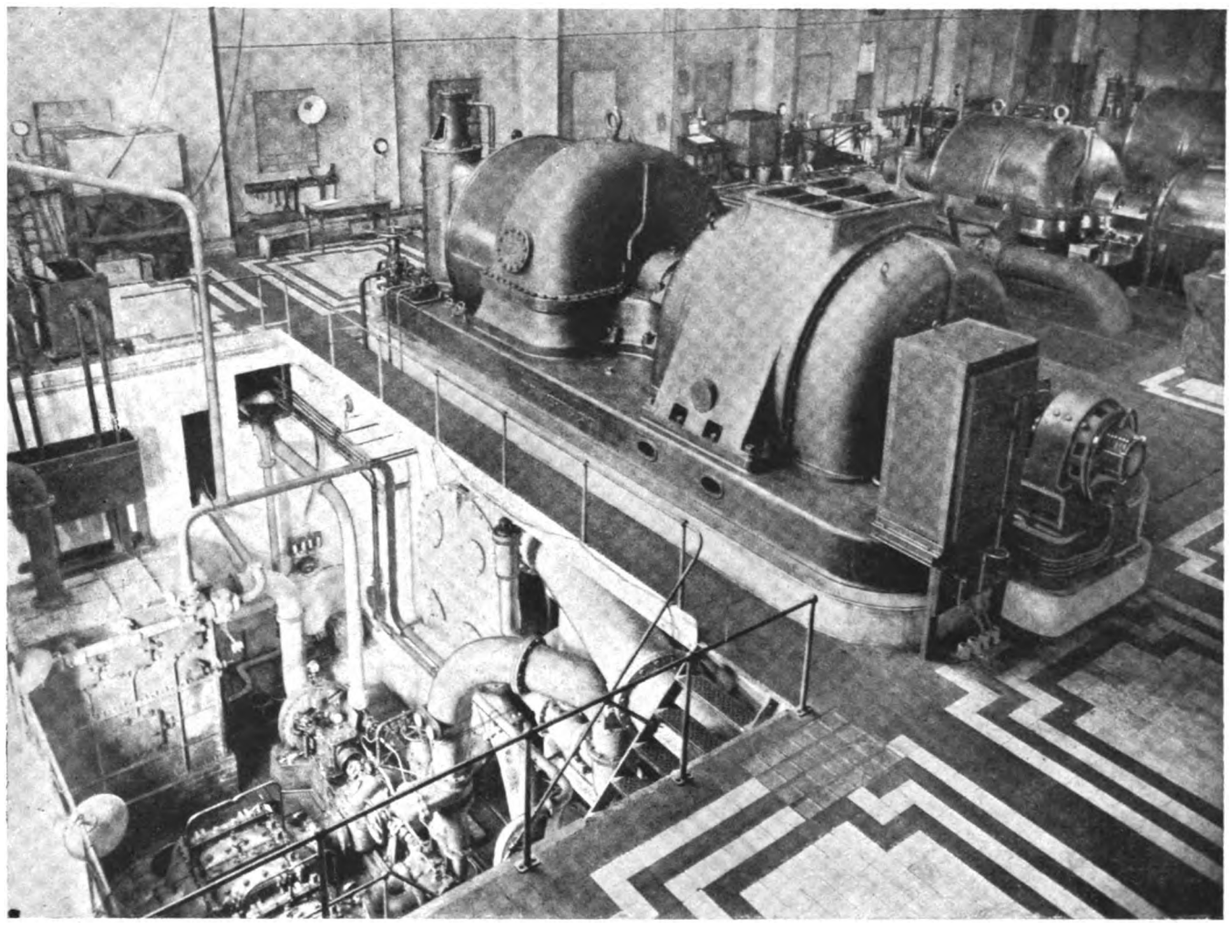
Steam at 180-lbs. pressure with 170 deg. of superheat is applied to these turbines, and they were fitted with ejector condensers in uniformity with the older plant. The initial boiler installation consisted of two Woodeson water-tube boilers, each having a heating surface of 6,100 sq. ft.

Early in 1915 the city authorities adopted a recommendation by the acting city electrical engineer, Mr. J. F. Magoris, for the installation of further plant, and it was decided in the interests of efficiency and general economy to instal a larger unit than previously and to adopt surface condensing, the contract for a 5,000-KW. turbo-alternator set being placed with Messrs. Dick, Kerr and Company, who had supplied the earlier turbine sets. The new extension also includes a further Woodeson water-tube boiler of the same capacity as the previous two boilers, and a Stirling boiler having a heating surface of 8,200 sq. ft. Both these latter two boilers are fitted with Erith-Riley underfeed stokers.

It was necessary to restrict the depth of excavation below the turbine set, in order not to interfere with the piling under the foundations, and with a view to obtaining the necessary head room for the condensing plant, the turbine bedplate was raised some 12 in. above the normal floor level.

The turbine set is a compact machine, measuring roughly 30 ft. in length over the bedplate which is longitudinally split. It is designed for an output of 5,000 KW. at ·8 power factor at full load when running at a speed of 1,500 revolutions per minute, and will carry 50 per cent. overload. The steam conditions are similar to those of the earlier turbines and the condensing plant is designed to give a vacuum of 28½ in. with 30 in. barometric pressure.

The turbine is a standard Dick-Kerr impulse machine, with 11 stages, the first being a velocity compounded stage. The ordinary stages are fitted with special bronze blading, while the velocity stage has alloy steel blades. The turbine body is of cast iron, split horizontally. The first half dozen diaphragms are of cast steel, and the remainder of cast iron, and the body is supported at the exhaust end in such a way as to allow



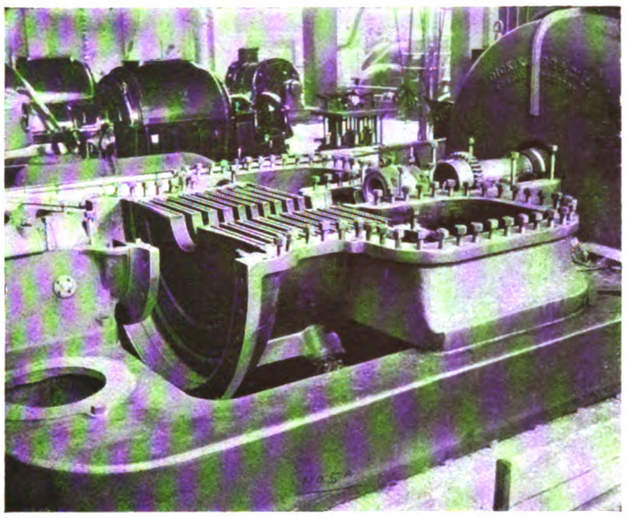
5,000-K.W. Dick-Kerr Turbo Generator with Willans Condensing Plant—Hull Corporation's Power Station.

Digitized by Google

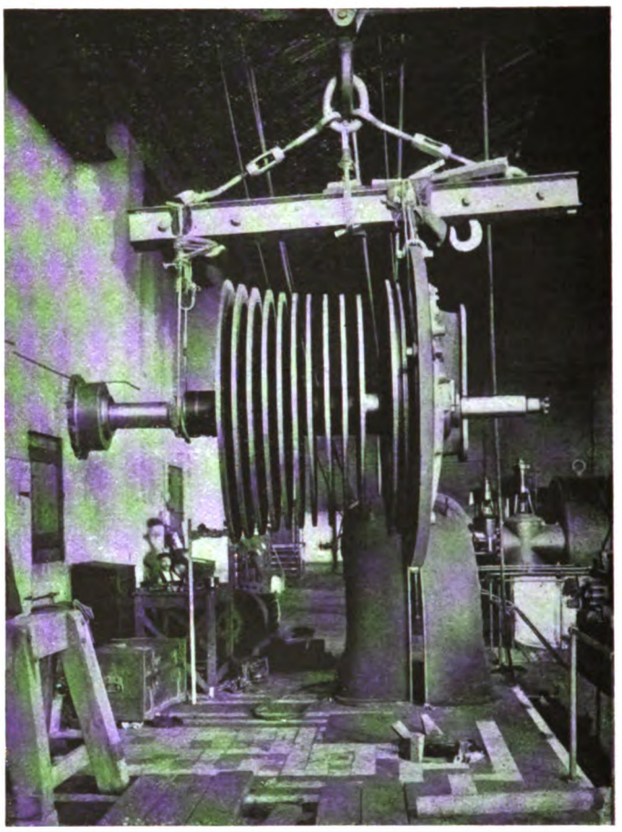
of freedom for expansion. The steam admission end is closed by a cast-iron cover, with high-pressure steam-carrying parts of cast steel; the disc wheels forming the rotor are of special quality steel, and were accurately balanced and carefully tested when complete with their blading. All the turbine glands are of the labyrinth type and the end glands are steam-sealed, any excess steam from the high-pressure glands being taken to an intermediate stage of the turbine.

The turbine governor is of the centrifugal type, worm-driven from the main shaft, and by means of an oil relay this actuates a double-beat throttle valve with individual nozzle regulating valves arranged in series, which automatically control the admission of steam to the turbine under all load conditions. The actual movement of these valves is effected by pressure oil, the sequence of operations being the opening of the double-beat throttle valve, controlling the admission of steam to the nozzle-regulating valve chamber and the first group of nozzles, followed successively by the opening of the individual nozzle regulating valves, four in number, which control the admission of steam from the valve chamber to the remaining groups of nozzles. In addition to the ordinary governor, the usual safety governor is fitted in the turbine shaft and is arranged to come into operation when the turbine attains a speed of 15 per cent. in excess of the normal.

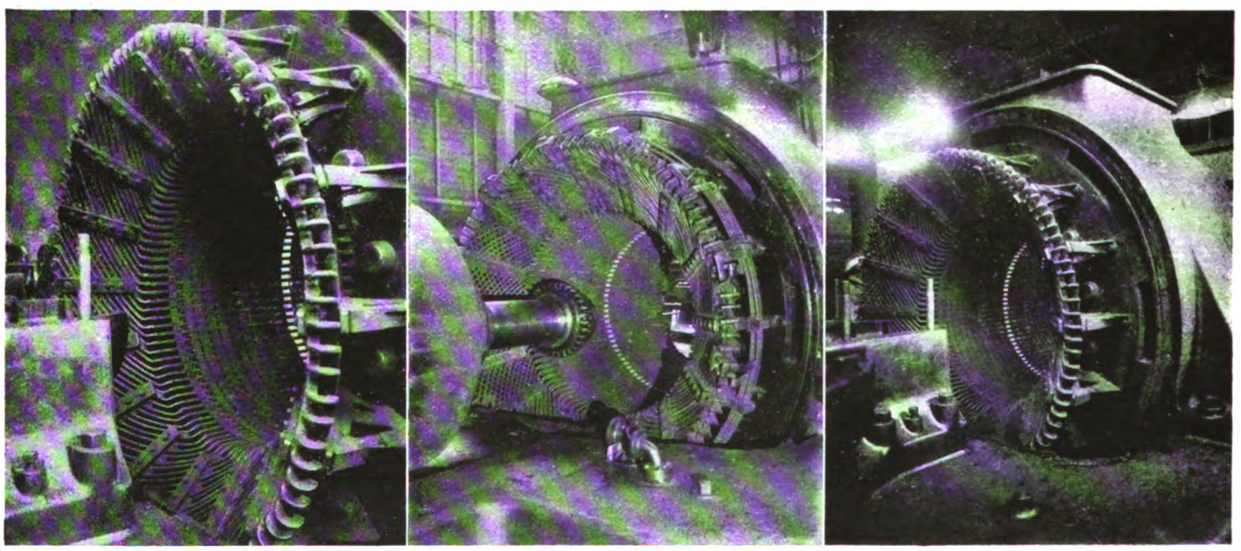
A complete oil circulating system is provided to the bearings and for supply to the governor relay, pressure gauges being fitted to indicate oil pressure at the thrust block and relay cylinder. The oil after use is filtered and cooled in a condenser-type oil cooler, having 200 sq. ft. of cooling surface. For starting-up purposes, before the main oil pump comes into operation, a duplex steam-driven oil pump is fitted. The turbine



Lower Half Case of Turbine Casing.



Turbine Rotor and End Cover.



Views Showing Basket Winding on Alternator.

Digitized by Google

is coupled to the alternator by a claw-type flexible coupling, lubricated by pressure oil.

The alternator frame and laminated core are built up in one piece, the laminations being securely held in dovetail slots machined in the frame. An interesting feature of the machine is the stator winding, which is of the barrel or basket type. The coils are former wound and mica insulated, and are laid in open slots; the projecting end-turns are given a conical formation, being inclined at about 45 deg. to the axis of the machine and supported in position by massive bronze clamps. This arrangement gives an extremely rigid and at the same time well-ventilated construction.

The rotor, which is of the cylindrical type, and shaft are machined from one solid forging, ventilating channels being cut below each coil and radial ventilating slots near the centre of the rotor. The winding consists of copper straps laid flat in the slots and bent on edge, with mica insulation between turns and to ground. The overhanging ends are retained in position by means of massive bronze end caps.

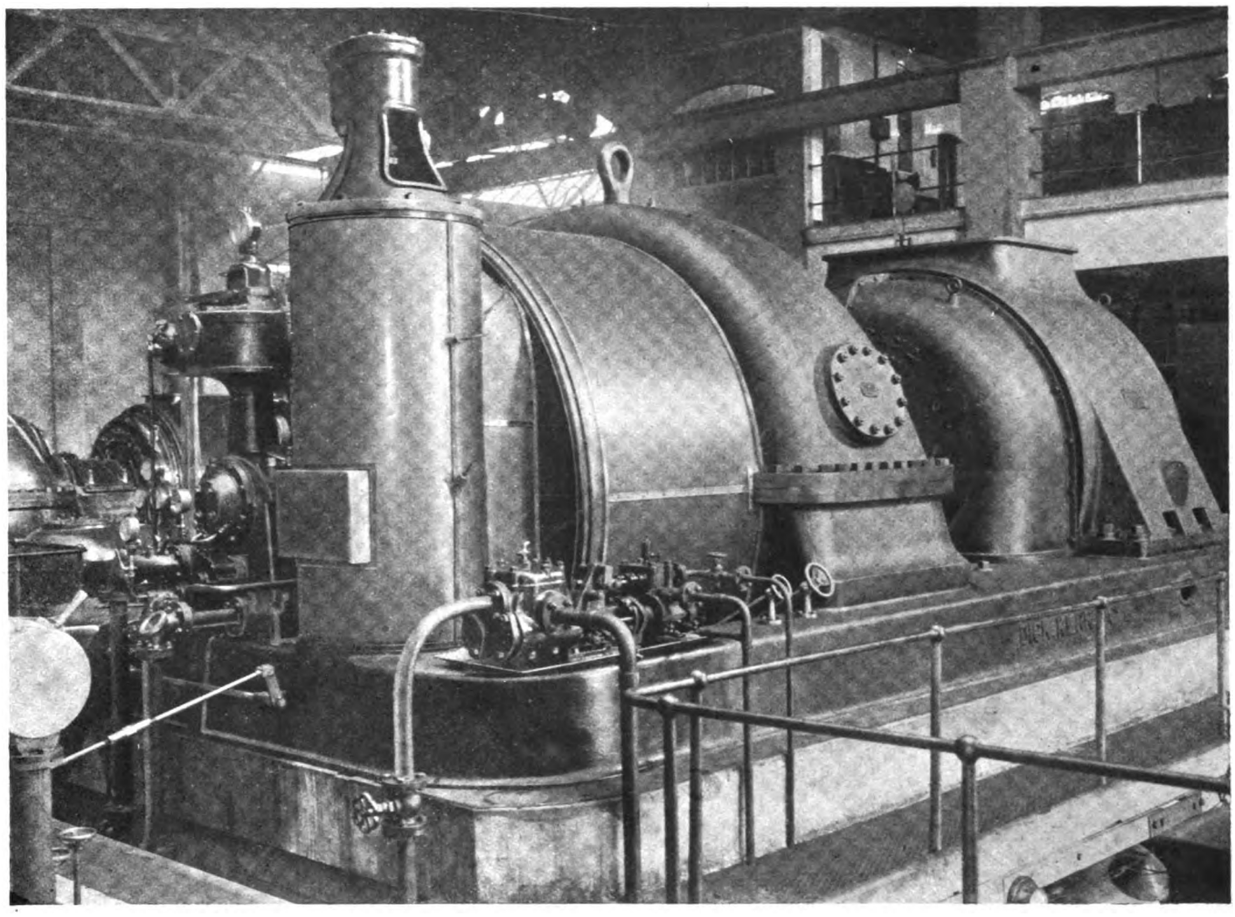
The ventilating air for this machine is passed through a Heenan and Froude cooler, being forced through the machine by an external motor-driven fan and discharged through the chimney opening on the top of the stator. A liberal number of air ducts is provided in the stator, and the cooling is effected by a combination of the radial and circumferential system. An exciter of the overhung type is carried on the end of the alternator shaft.

Although the lifting capacity of the crane was not equal to the weight involved, it was considered desirable that the stator should be in one piece, and the stator was therefore skidded into position, being fixed in a timber cradle supported by timbering, etc., over the condenser well and subsequently, by means of successive lifts alternately on either side of the frame, followed by the insertion of timber packing, raised the requisite amount to allow of its being slid into position on the bedplate.

It will be noted that the main field rheostat is fixed on the bedplate beside the exciter, this arrangement being adopted with a view to saving heavy copper cable runs to the switch gallery. This rheostat can if necessary be motor operated.

The condensing equipment, which was supplied by Messrs. Willans and Robinson, embodies some interesting features. The condenser itself has a cooling surface of 7,300 sq. ft. and operates in conjunction with the Willans rotary air pump system, in which a portion of the circulating water is passed through an ejector which takes the place of the ordinary air pump. The plant is designed to handle 70,000 lb. of steam per hour with an air displacement of 230 cub. ft. per minute. The circulating water is delivered by two centrifugal pumps working in parallel, one of which delivers direct while the other delivers through the air ejector to the condenser; no additional water is required for the operation of the ejector.

The circulating, ejector, and condensate pumps are direct coupled, mounted on one bed, and driven by a Willans single impulse wheel turbine running at 2,000 revolutions per minute. The circulating water suctions are each coupled to duplicate strainer boxes, to enable a box to be opened for cleaning without affecting the circulating water supply to the pumps. This arrange-



Steam End of 5,000-K.W. Turbo-Alternator Set at Hull.

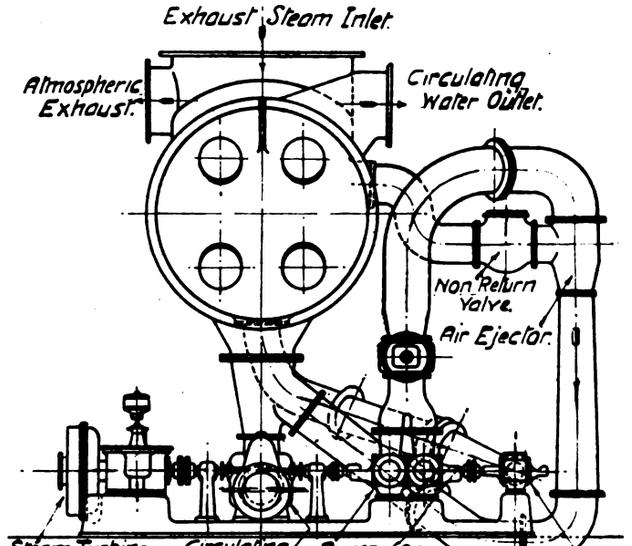
Digitized by Google

ment is necessary, because at seasons of the year the water contains weeds and at others numerous eels. The exhaust steam from the pump turbine is utilised in a direct-feed heater for heating the condensate, and should the latter be insufficient to absorb all the heat available, arrangements have been made by which the condensate can be supplemented from the general feed water supply. For testing the condensate is weighed by a Holden and Brooke water meter.

A flooding valve is fitted to the condenser. The flooding water—which is taken from the town supply—is introduced through a perforated annular pipe fitted below the exhaust flange of the turbine. In case of pump failure this arrangement ensures a gradual transition to atmospheric working.

The guaranteed steam consumptions of this set per KW.-hour were as follows :—50 per cent. overload, 13·5 lb. ; 25 per cent. overload, 13 lb. ; full load, 13 lb. ; 75 per cent. load, 13·5 lb. ; 50 per cent. load, 14·3 lb. ; and 25 per cent. load, 16·9 lb. It is satisfactory to know that these figures have been improved on in service.

In common with other undertakings, that of the Hull Corporation has experienced the difficulty of obtaining the necessary plant to cope with the increasing demand for electricity, and for many months



Arrangement of Rotary Pumps and Air Ejector, for Condensing Plant at Hull.

prior to starting up the 5,000-KW. turbine set the two previously-installed 2,000-KW. Dick-Kerr machines had been regularly supplying loads of up to 4,800 KW. between them. The 5,000-KW. set was taken into commission on November 15 last, and two days later was loaded in excess of its normal rating.

Some idea of the growth of three-phase supply in Hull can be gathered from the fact that in 1911, when three-phase supply was started, the load was 100 KW., while at the present time it has risen to 5,200 KW. Over 35,000 H.P. of electric motors are now connected to the mains, and individual motors of large size are being adopted, the department being about to connect up one of 900 H.P. It may be mentioned that the department operates 17 rotary and nine static sub-stations—13 of these are three-phase sub-stations.

We are indebted to Mr. Magoris, the acting city electrical engineer, for his assistance in preparing these particulars of the most recent development in connection with the undertaking which he controls.

LOAD FACTOR ON TRAMWAYS.

E. S. RAYNER.
Borough Electrical Engineer and Tramways Manager, Doncaster.

When the question of efficiency with regard to every phase of the engineering and manufacturing undertakings of the country is under review—and it has been realised through painful experience that to hold our place as a nation in the front line with other nations, the shibboleths of vested interest must receive some very heavy blows—the question of the utilisation to the full of tramway undertakings in this country must receive a very large amount of attention.

The owners of tramway undertakings were content to accept the ordinary passenger receipts as a fair return for their outlay. Those who gave consideration to the question of other forms of traffic were faced by the herculean task of fighting the forces of vested interest, upsetting Acts of Parliament, and deleting clauses inserted in tramway orders. This outlook offered such a small chance of success that no single undertaking considered the risk worth taking. At the present time conditions have altered. With increased expenses the attainment of a far greater efficiency than was ever anticipated in tramway work, and above all the imperative need of national efficiency, the time has come when no opportunity for increasing the productivity of expended capital can be overlooked.

The first cars on the average tramway system start about 5 a.m. and the last cars at present return to the shed about 11 p.m. ; this leaves a period of six hours during which the capital invested is lying dormant, and it appears to me, especially under present conditions, that this time might very well be utilised for the carriage of minerals to central distributing depots. This applies more particularly in the case of coal. Many towns have collieries in the irimmediate vicinity in close proximity to their tramway routes, and at a very small cost connections could be run to the pit heads, where trailers of suitable design could be filled during the daytime and attached to the ordinary cars at night, and thus carry out a distribution of the whole of the local requirements for coal. It is quite a simple matter to arrange for central depots, and in many cases it would certainly pay firms along the tramway routes to bear the cost of a siding from the tramway route into their works. In this way from the point of view of tramway efficiency, the load factor on the tramways would be increased by something like 20 per cent., and the dormant capital expenditure would be reduced to a minimum. Apart from the benefits that would accrue to the undertaking, there is the national point of view.

Taking the conditions at Doncaster as an example, there are no less than five large collieries in operation within a radius of five miles of the centre of the town, nearly all of which are within easy reach of the tramway routes. Coal is purchased from some of these collieries by the electricity department, and at present is delivered as follows :—

It is loaded into railway wagons at the pit head, the following day it is delivered into local sidings, which are only two and a half miles from the pit head. Here it is man-handled into carts, the railway wagons " with luck " being returned to the colliery the following day, the coal being carted from the sidings to the electricity works. This is a most wasteful system of distribution, as the useful running time of the railway wagons cannot exceed half an hour, for which they are out of general service for a period of three days. Again, there is the cost of handling the coal into the cart and

Digitized by Google

the time of the cart returning empty to the sidings. Under the suggested arrangement the tramway trailers would go to the pit head and be taken directly to the electricity works, or any other works with a suitably arranged siding, and the coal tipped directly into the bunkers or elevator hoppers.

When we are asked to economise at every point there is undoubtedly a very simple and effective means of realising great economies in this direction; the cost of the rails and trailers is a comparatively small item.

The great bar to the realisation of this ideal is the fact that the majority of undertakings have clauses in their tramway and light railway orders which prohibit them from attempting anything of this sort. Now that the railways are in the hands of the Government, and now that the shortage of wagons is becoming a very serious matter, it certainly behoves the Government to give assistance with regard to the removal of these disabilities and to relieve railway rolling stock of what is undoubtedly a most inefficient duty. It should be used for purposes where the loading up and terminal wastage of time does not bear such an undue proportion to the useful running or carrying time on the track.

I have not dealt with the carriage of general goods or distribution of tradesmen's goods to outlying districts, as this is receiving a considerable amount of attention, and is more or less an obvious addition to the functions of a tramway system. The elaboration of the general principle is only a matter of local conditions and desirability. As to minerals, so far as I know, this question has not been tackled to any very general extent, but obviously it is one that should receive immediate attention and the wholehearted support of the Government.

TRADE AFTER THE WAR.

Encouraging Organisation Prospects.

After a period of inactivity which was more apparent than real, the great subject of the preservation and development of British trade after the war is growing with a rapidity which warrants the strongest hopes. And the development is in the right direction. The results of prolonged and searching investigation by various bodies of experts are coming to light, and the conclusions point so unmistakably in one direction that the politicians who, like others, have learned wisdom from the war, are bound to take action.

Let us do a little cataloguing just to see how things stand. In the spring Lord Balfour of Burleigh's Committee who dealt with general trade policy after the war issued a second report, which amplified their original proposals in favour of imperial preference and of various steps to shield empire trade from German penetration and domination. This was followed by the issue in June of a whole series of reports by Departmental Committees which had been appointed in 1916 to consider the position of various specific trades. All these reports recommend specific action such as the prevention of dumping, prohibition for a period of years of importation of enemy goods, the securing of adequate supplies of raw material, a thorough organisation of home industries, the drawing together and consolidating the interests of employers and employed, the foundation of industrial banks for financing developments, and so forth. The reports in which readers of this journal will be most interested are those of the committees on the electrical trades, the iron and steel trades, and the engineering trades. Another Board of Trade Committee has reported on electric power supply, backing up the former report of the Coal Conservation Committee for a national system of electric power production and outlining a scheme of organisation for carrying it out. A peculiar feature in connection with the reports on various trades is that they appear to have been hung up for a year before publication. They come now, however, at a very appropriate moment.

Empire Views.

All these reports are now under the consideration of the Government. What is of equal if not of more importance is the fact, officially announced at the end of June, that all such post-war problems are the subjects of resolutions passed by the Imperial War Conference sitting in London. The Inter-Allied Parliamentary Commercial Conference which began its sittings early in July has also been dealing with the subjects from the point of view of the Allies, and of the resolutions passed at the original Paris Economic Conference.

Two features about the Departmental Committees' reports may be emphasised. One is that we have for the first time what may be called official recognition of facts and arguments which have been put forward by manufacturers and traders for years. Protection especially of key and nascent industries, anti-dumping regulations, financial and other aid where necessary, counter-offensive to German trade machinations which have always political and military considerations behind them—these and a hundred other things have been urged for years on deaf and blind British Governments, rendered void of sense by party politics and the catching of votes. One good effect of the war accordingly is that the two blind elements in this country, the Government and the working classes, are now able to see. The other feature of these reports is their wonderful unanimity.

Power Supply and Electrical Trades.

Readers may be recommended to study with special care the reports of the Board of Trade Committee on electric power supply and of the Departmental Committee on electrical trades after the war. The former is dated April of this year, but the latter belongs to the series which were over a year old when published. The Power Supply Committee's report supports all the conclusions of the Coal Conservation Committee for a comprehensive national scheme of power production and distribution, and works out a scheme for national Electricity Commissioners and District Electricity Boards. These details would be matter for adjustment and settlement if and when the Government bring forward a Bill to give effect to the recommendations. The Electric Trades Committee's report emphasises the obstruction placed legislatively and in other ways on the development of electrical industries in this country, and advocates a thorough reform of legislation and conditions affecting the generation and distribution of electricity and affecting the promotion, construction, and operation of tramways and light railways. The prohibition of the import of enemy goods and the imposition of import duties are insisted on, as well as numerous other means for helping the British electrical trades. The part of the report dealing with electric traction is specially grateful.

The subjects covered by all these reports are of vast extent and importance, and we have only been able to make brief reference to them. The full reports themselves should be carefully studied, and it will then be realised that there is at last some chance of a radical change for the better being effected in trade conditions in this country.

Digitized by Google

THE
Tramway and Railway World

FOUNDED IN 1892 AND PUBLISHED BY
THE TRAMWAY AND RAILWAY WORLD PUBLISHING COMPANY, LIMITED,
AMBERLEY HOUSE, NORFOLK STREET, LONDON, W.C.2

SUBSCRIPTION RATES

THE TRAMWAY AND RAILWAY WORLD can be obtained, post free, at the following rates:
FOR THE UNITED KINGDOM—Twenty-five Shillings per annum.
FOR ALL PLACES ABROAD—Thirty Shillings per annum.
Single Copies—One Shilling (Postage, 2 pence—Abroad, 5 pence).
THE ANNUAL SUBSCRIPTION INCLUDES 64 ISSUES, OF WHICH 12 ARE ILLUSTRATED NUMBERS.

In consequence of the restrictions on the use of paper, readers will be unable to obtain copies of THE TRAMWAY AND RAILWAY WORLD unless a definite order be given in advance. Those who order copies in this way from newsagents and experience any difficulty in obtaining them should communicate with us.

THE EDITORIAL AND PUBLISHING OFFICES OF
THE TRAMWAY AND RAILWAY WORLD
ARE AT AMBERLEY HOUSE, NORFOLK STREET,
LONDON, W.C.2
Telephone No.: GERRARD 2948.
Telegraphic Address: "TRAMIGRO, ESTRAND, LONDON."

LONDON, JULY 11, 1918.

Maximum Fares.

Sir Albert Stanley, President of the Board of Trade, is to be congratulated on the promptness of his recent action in connection with the question of maximum tramway fares. Within a few days after the issue of the report of the Select Committee which was appointed to investigate the subject, he introduced in the beginning of July a Bill in the House of Commons the object of which is "to enable the statutory provisions affecting the charges which may be made in respect of certain undertakings to be temporarily modified." The Bill gives effect to the contentions of the two tramway associations and to the recommendations of the Select Committee. It is, we think, unfortunate that the Bill has been made to apply to other undertakings, such as gas, water, and electricity undertakings, the conditions of which are by no means identical with those that prevail among tramway authorities. All these classes are, it is true, suffering from increased expenses for wages, materials, and fuel, and some of them, even when making their statutory maximum charges, are unable to make both ends meet, but they do not suffer from the same disabilities as tramways, and their inclusion in the Bill will raise difficulties that a Tramway Bill pure and simple would probably have escaped. Under the Bill a Government department—in the case of tramways, the Board of Trade—will have power to modify the statutory provisions, so that higher charges than those now authorised may be made. There are limitations on the increased fares or charges which may be allowed, but even with these the owners of the undertakings should be largely relieved from their present anxieties. As the public is so largely affected by the Bill, and in so many different ways, there will undoubtedly be considerable opposition; but so far, at least, as tramways are concerned, the case for the change is overwhelming. In connection with railways the public have had to submit to an increase of 50 per cent. in fares, and tramways have quite as good a case. They have, in fact, a better case, as they are not, like the railways, guaranteed their pre-war dividends. The Bill is to remain in force only for the period of the war and for two years thereafter. The second reading was passed on July 8.

London Police Restrictions.

One of the troubles under which tramway undertakings in the London area have always suffered, and from which tramways in other parts of the country are free, is the restrictions imposed by the Metropolitan Police. For some reason the chief officials of that force have always looked on tramways with a jaundiced eye, and have hampered them in every possible way. Unfortunately they have great powers in that direction, and the local authorities in the metropolis have no control over them. Some London police objections have only been overcome by Parliamentary powers being got for the purpose, but it is not often easy to obtain that heroic remedy. At the present time the police regulations are specially troublesome. They were framed many years ago, and in times of peace, for the then existing conditions, and in such times it was generally possible to comply with them, even if at much inconvenience or expense. But now when times are wholly changed, when every possible expedient should be adopted to meet emergencies and to allow of the work of transportation being carried on in spite of the scarcity and high cost of labour and materials, police regulations remain practically unaltered. That

Digitized by Google

would not matter so much were it not for the fact that attempts are made to enforce them with the cast-iron monotony and indifference to public convenience characteristic of officialdom. For example, we hear of the difficulties which are thrown in the way of getting licences for car drivers. The number of suitable men obtainable for training as drivers is very small; yet when some are found all the old trouble is raised if every punctilio of the police regulations cannot be complied with. Again, there is paint. Cars must be painted and varnished at certain intervals, according to the regulations. But how can that be done if the paint and the varnish cannot be had, or if painters cannot be found? Yet there are reports of attempts to prevent cars going on the road because they have not been provided with the requisite number of coats of varnish. Obviously the only painting which should be done at the present time is that which is absolutely necessary for preservation. Again, we hear of police objections to slight variations in car lighting arrangements with a view to avoiding accidents in darkened streets. The fact, of course, is that no car lighting restrictions are now necessary any more than they are necessary in the case of railways. The fact of the matter is that the Home Office which is, or is supposed to be, responsible for the Metropolitan Police, ought to take the subject in hand, and impress on its subordinates the necessity of giving tramway managers the fullest possible opportunity to maintain services which are so essential to the prosecution of the war. The managers are responsible officers who are in a far better position to judge what precautions are desirable and necessary than any officials of Scotland Yard can be. The tramway authorities of the London area should combine to bring pressure to bear on the Home Office, and for this purpose they might well work through the Association of Metropolitan Tramway Managers, which could, of course, obtain the aid of the two national tramway associations, whose influence has been an exceedingly helpful factor in various other ways since the outbreak of war. Fortunately only the London area is concerned, but that means the interests of seven or eight millions of people, a great number of whom are directly concerned in war work.

Reconstruction in Electrical Enterprise.

There can be no ground for questioning the wisdom of the inquiries of three committees on subjects appertaining to electrical and traction matters. None of the three is the offspring of visionaries; only one has its origin in the Ministry of Reconstruction, and that one dealt with the practical question of coal conservation. Closely linked to that are subjects taken up by the remaining two committees. The latter were appointed by the Presidents of the Board of Trade, past and present, the task of one being to consider the electrical power supply, while to the other was deputed the consideration of the position of the electrical trades after the war. With the first and second reports we have already dealt. Their main conclusions are on the whole acceptable both from the national and the municipal points of view. The error of the past—a too parochial treatment—is especially complained of in the third report—that of the Departmental Committee on the Electrical Trades. It is given in considerable length elsewhere in this issue. The committee have rendered a national service by their trenchant exposure of the causes of the injury inflicted upon the electrical industry hitherto, and their remedial proposals should command approval. The term "trades" fails to do justice to the comprehensive field embraced by the committee's deliberations. These are divided into four sections, relating to electricity generation and transmission in the United Kingdom, electric traction, manufacturing, and financial interdependence between manufacture and finance. A commentator can do little else than express a hope that immediate efforts will be made to support the committee's recommendation that remedial and unifying legislation should be introduced forthwith. Unless that course is adopted the nation will be blind to one of the lessons of the war, namely, that the conflict has demonstrated that the safety and trade of the Empire are dependent on the proper employment of electricity. It has always been regarded as a key industry by Germany, with results that for years have been disastrous to this country and the Colonies. For one of the principal recommendations support can be adduced from reports submitted by committees of the Legislature during the past two decades. We refer to the reform of

Digitized by Google

procedure relative to private Bills and Provisional Orders, which was dealt with in these columns on April 11 last, following recommendations presented by Acquisition of Powers Sub-Committees of the original Reconstruction Committee. Not the least important sections of the present report are the statements relating to the paralysing effects of the purchase clauses in the legislation governing electrical supply and tramway companies. That provision not only debars a company from keeping abreast of technical progress, but prevents the expenditure of fresh capital to the best advantage, with consequent disadvantage to the public interest. If the parties interested can put forward a better method of dealing with supply and traction matters than the suggested independent Board of Commissioners, they should table their scheme without delay. The report wisely insists that provision should be made for railway electrification being carried out on some settled general principle, so that all main or local lines may be properly co-ordinated, and the power-stations placed in positions adapted to both military and civil needs. The best tribute to the worth of the report is its impartiality. The execution of its recommendations may, for the time being, militate against individual private interests. On the other hand, it should open up new prospects for enterprise in electric traction, and to British electrical manufacturers promises opportunities such as they have never before enjoyed. To secure these advantages every effort should be put forth without delay.

SAFETY FIRST IN INDUSTRY.

A conference, arranged by the London Safety First Council, was held at the Mansion House on June 12, to inaugurate a national industrial "safety first" campaign. Lord Leverhulme, who presided, said that in Germany £50,000,000 was saved in industry every year by attention to "safety first" appliances. The object of the new movement was to ensure that we should have throughout the United Kingdom such a condition of "safety first" as would give us the equipment for winning the industrial war after we had won the military war.

Mr. W. Hayes Fisher, M.P., President of the Local Government Board, welcomed the movement, to which he promised to give every assistance. It was satisfactory, he said, to learn that from street accidents the sphere of operations of the Safety First Council was to be extended to accidents arising from industrial occupations. They must use education to make people see that it was their duty to themselves, to their families, and to the State to take every possible precaution to preserve their lives.

Mr. G. Roberts, M.P., Minister of Labour, said that no works should be tolerated in the country unless they were sanitary and properly lighted and the machinery was safeguarded. Then they would be entitled to expect the workers to take every care to avoid accidents and disease. They must insist upon certain standards of equipment in the various works and factories, and in this matter he promised the support of his department.

Mr. W. Brace, M.P., Under Secretary for the Home Department, wished the movement every success, and assured the promoters of the co-operation of the Home Office.

A BILL TO INCREASE STATUTORY CHARGES.

MAXIMUM FARES ON TRAMWAYS, ETC.

The following is the text of a Bill which has been introduced in the House of Commons by Sir Alfred Stanley, President of the Board of Trade, to enable the statutory provisions affecting the charges which may be made in respect of certain undertakings to be temporarily modified.

1. (i.) Where it appears to the appropriate Government Department that the financial position of any undertaking to which this Act applies has been adversely affected by circumstances arising out of the present war, the Department may, if they think fit, by order provide for the modification of any statutory provisions regulating the charges to be made by the undertakers, and of any statutory provisions consequential on or supplemental to any such provisions as aforesaid, for such period during the continuance of this Act, in such manner, and subject to such conditions, as appear to the Department to be just and reasonable :—

Provided that :—

(*a*) Where the undertakers are a local authority no modification shall be authorised which will increase the statutory maximum charge by more than 50 per cent., or which is more than sufficient so far as can be estimated to enable the undertaking to be carried on without loss ; and

(*b*) In any other case no modification shall be authorised which is more than sufficient to enable a dividend on the ordinary stock or shares of the undertaking to be paid at half the standard or maximum rate of dividend, if any, prescribed for the undertaking, or at half the pre-war rate of dividend, whichever is lower.

(ii.) An application to a department for the purposes of this Act shall be accompanied by such information, certified in such manner, as the department may require with respect to the financial position of the undertaking in question.

(iii.) The undertakings to which this Act applies are tramway undertakings, including light railways constructed wholly or mainly on public roads, and undertakings for the supply of gas, water, and electricity.

(iv.) For the purposes of this Act —

The expression "statutory provisions" includes the provisions of any order having the force of an Act ;

The expression "appropriate Government Department" means, in relation to gas and water undertakings carried on by local authorities, the Local Government Board, and in relation to other undertakings the Board of Trade ;

The expression "local authority" includes any commissioners, trustees, or other public body of persons carrying on, otherwise than for purposes of private profit, any undertaking to which this Act applies ;

The expression "pre-war rate of dividend" means the average rate of dividend for the three financial years immediately preceding the war.

2.—In the application of this Act to Scotland the Secretary for Scotland, and in the application of this Act to Ireland the Local Government Board for Ireland, shall be substituted for the Local Government Board.

3.—(i.) This Act may be cited as the Statutory Undertakings (Temporary Increase of Charges) Act, 1918.

(ii.) This Act shall have effect during the continuance of the present war and for a period of two years thereafter, and no longer.

REPORT OF SELECT COMMITTEE ON FARES.

The recommendations of the Select Committee of the House of Commons on fares were given in our issue of June 13. A full report of the proceedings of the committee and minutes of evidence have now been officially published (Stationery Office, price 2d.).

The committee was appointed on April 24, and consisted of the following :—Sir William Pearce, chairman, Captain Barnett, Sir James Boyton, Mr. Broughton, Sir Arthur Fell, Mr. Randall, and Mr. Watt. Three meetings were held, and evidence was given by Mr. R. J. Howley, vice-chairman of the Council of the Tramways and Light Railways Association and joint manager of the British Electric Traction Company ; Mr. A. L. Barber, secretary of the Metropolitan Electric Tramways, Limited, and Mr. C. J. Spencer, honorary secretary of the Municipal Tramways Association of Great Britain and Ireland, and general manager of the Bradford Corporation Tramways.

Digitized by Google

REPORT OF BOARD OF TRADE ELECTRICAL TRADES COMMITTEE.

LEGISLATIVE RECOMMENDATIONS RELATING TO TRACTION, MANUFACTURING, ENGINEERING, AND FINANCIAL MATTERS.

Sir Albert H. Stanley, President of the Board of Trade, has issued the report of the Departmental Committee on the Electrical Trades, which was appointed by his predecessor, Mr. W. Runciman, in April, 1916, to consider the position of the electrical trades after the war, with especial relation to international competition, and to report what measures, if any, are necessary or desirable in order to safeguard that position. The committee comprised the Hon. Sir C. A. Parsons (chairman), Mr. J. Annan Bryce, M.P., Mr. T. O. Callender, Mr. James Devonshire, Mr. B. M. Drake, and Sir John Snell. The committee heard evidence from the Institution of Electrical Engineers, the Incorporated Municipal Electrical Association, the Association of Electric Power Companies, the British Electrical and Allied Manufacturers' Association, the Cable Makers' Association, the Tramways and Light Railways Association, from eminent consulting engineers, from manufacturers of machinery, cables and other electrical appliances, directors and engineers of public supply undertakings, from bankers, and many others. We append lengthy extracts from the report.

NATIONAL IMPORTANCE OF THE ELECTRICAL INDUSTRY.

The committee is of opinion that the national importance of this industry has never been realised either by Government or by the public, and as a consequence both the industry and the country have suffered from legislative errors.

Through the efforts of Faraday, Wheatstone, Kelvin, Swan, Hopkinson, and many others, Great Britain was, and should have continued, first in electrical enterprise. Mines and factories were so situated as to gain rapid advantage from the application of electrical science, and railways, especially the urban and suburban lines, were, owing to density of population, ideally suited to electrification. In order, however, to bring electrical energy into practical use it was necessary to employ cables, either underground or overhead, the installation of which involved interference with streets, roads, and private lands. Manufacturers of electrical plant have been held back while Parliament and local authorities debated how the distribution and use of electricity might be prevented from infringing conventional conceptions of public privileges and vested interests. Hence the progress of the industry has throughout been hampered by political considerations. Abroad there were strong encouragements, in Great Britain irksome restrictions, and the evil effects on the British electrical industry justly entitle it now to special remedial measures, which can be secured only by legislation. Such legislation should be passed without delay.

The prosperity of our industries depends largely on cheap energy for driving machinery, and even a fractional reduction in price is of importance in determining the ability of manufacturers to compete in the world's markets. The application of electricity to agricultural purposes is also claiming attention, and will, without doubt, extend. The scientific replanning of our distribution of energy would effect a saving of 50 million tons of coal per annum. This replanning would reduce the cost of power for manufacturing, lighting of streets and houses, propulsion of railway, tramway and road vehicles. Witnesses of high authority estimate the loss incurred through failure to take full advantage of electrical progress at £100,000,000 a year, a loss preventable by concentrating generation under improved administration.

The value to this country of the electrical manufacturing trade already amounts to 22½ millions sterling a year. These figures represent only a fraction of the trade which can be obtained if the blunders of the past be rectified.

It is not too much to say that the war has demonstrated the safety of the Empire to be dependent on the employment of electricity. The output of munitions in the great industrial areas could not possibly have attained anything like its present scale had not an enormous aggregate horse-power of electrical energy been available for the supply of power and light. The emergency has proved the electrical industry to be a "key industry." The committee proceed to report on the position of the industry from five sectional points of view.

GENERATION AND TRANSMISSION IN THE UNITED KINGDOM.

Section I. states that as the production of generating and distributing plant forms the chief part of electrical manufacturing it has been necessary to consider whether present methods of generation and distribution are adequate, and if not how they can be improved. The witnesses examined on these points concur in the opinion—

(*a*) That it is of vital importance to every industry to have a free circulation of cheap and efficient power supply.

(*b*) That owing to obstacles caused by the present administrative methods, which they unanimously condemn, the supply has till now been deficient, with consequent serious loss to the nation.

(*c*) That the removal of these obstacles will be followed by a widespread extension in the use of electricity and a greatly increased demand for every kind of electrical plant.

The home demand alone for electrical machinery and apparatus should already have been sufficient to employ a manufacturing industry with at least three times the present output. There is therefore urgent need to place electrical energy at the disposal of all manufacturers and at the lowest possible price, which can best be done by the employment of large units in large central generating stations with suitable interconnection between the various areas of supply. This will involve the subordination or discontinuance of the smaller and uneconomical stations, and, as already stated, if full advantage is taken of the modern applications of electricity the annual saving in fuel alone would be not less than 50 million tons. The obstacles complained of arise partly from the prevailing official atmosphere and partly from legislative enactments. In this country the attitude towards electrical progress has been far too restrictive, in contrast with the widespread official and public encouragement of the use of electrical energy abroad.

The existing procedure is complicated and responsibility divided. At present all new or extension orders authorising electric supply must be sanctioned by the Board of Trade and afterwards confirmed by Parliament. All administrative matters affecting electrical undertakers generally are determined by the Board of Trade. The regulations of the Board of Trade are directed primarily to secure the safety of the public, and secondarily to ensure a proper and sufficient supply of electricity. Whether the undertaking be municipal or private, local considerations, owing to the possible exercise of Parliamentary pressure, may become the determining factor in the action of the authorities. In the past lack of foresight has allowed even adjacent undertakings to establish works differing, not only in type of plant and mains, but also in pressures and frequencies, with the result that linking-up and interchange of power is now extraordinarily difficult and costly. The mischievous effect of that policy has been brought into prominence by the attempt now being made to comply with the circular issued in 1916 by the Board of Trade urging undertakers to link up in the national intersts so as to reduce the consumption of coal and economise labour.

As a result of the Board of Trade's circular a joint committee has been appointed by the Incorporated Municipal Electrical Association and the Incorporated Association of Electric Power Companies to consider the question of linking up. This joint committee has issued a constructive memorandum on the present position of the public supply of electricity, including the following significant paragraph :—

> Sufficient time has elapsed and sufficient experience is available to show the defects of the original legislation. Experience has shown that the comparatively small areas of the companies and local authorities working under Provisional Orders are, in many cases, insufficient to enable advantage to be taken of modern improvements in plant. It is also evident that liability to compulsory purchase imposed upon the undertakings of companies working under Provisional Orders has restricted enterprise and retarded the development of electric supply. Since some of the companies operate in very important districts, immediate measures should be adopted to deal with this difficulty.

In cases where provision for compulsory purchase has been inserted, in the supposed interest of the public, it is impossible for the undertakings, as the time of purchase approaches, to keep abreast of technical progress or to expend fresh capital to the best advantage. In this case there is no necessary inconsistency between the interests of the public and of the individual, and it should be the aim of the State to secure to the nation the full benefit of scientific progress. Attention is also called to the anomalous inequalities of tenure as between municipalities, Parliamentary companies, and companies working under Provisional Orders.

The general concensus of evidence is that all matters concerning the development of electrical supply should be placed in the hands of a new and independent Board of Commissioners free from political control and untrammelled by traditions. It has been suggested that the Commissioners should be invested with the requisite authority to deal adequately with all questions of new Provisional Orders, interconnection of electrical areas, extensions or modifications of existing areas of supply, wayleaves and all technical questions connected therewith, as well as all matters affecting tramways and light railways (Section II. of this report), and that among its first duties the Board should be required (*a*) to advise upon detailed remedial and unifying legislation governing all electrical supply; (*b*) to determine all questions of concentration for generation purposes with resultant economy of coal and other savings; (*c*) to prepare at once a properly co-ordinated scheme of expansion which will enable local developments held over during the war to be proceeded with on proper lines immediately after the war.

The committee, recognising the great importance of these proposals and their far-reaching effect, addressed a memorandum to

Digitized by Google

the Board of Trade on January 19 last. As a result of this communication a new committee has been appointed "to consider and report what steps should be taken, whether by legislation or otherwise, to ensure that there shall be an adequate and economical supply of electric power for all classes in the United Kingdom, particularly industries which depend upon a cheap supply of power for their proper development." (This committee's report appeared in our issue of June 13.) The recovery of by-products from the distillation of coal has been discussed as an alternative to direct combustion of raw coal under boilers. This process has not yet been developed, but in any case it can be operated to advantage only in connection with large generating stations.

The evidence leads the committee to the following conclusions :—

(1) Government should recognise the dependence of the State, both from military and industrial standpoints, upon the supply of electrical energy regarded as a "key industry."
(2) The distribution of electrical energy should be regarded no longer as a parochial but as a national question of urgent importance.
(3) The present system of electrical generation and distribution is behind the times, and is a serious handicap in international competition.
(4) The present conditions are mainly due to faulty legislation, and to divided and therefore weak executive control.
(5) Remedial and unifying legislation governing the supply and distribution of electrical energy should be introduced forthwith.
(6) It is imperative that questions concerning the distribution of electrical energy should be freed from political influence, and considered solely from the point of view of national requirements, technical possibilities, and naval and military needs.
(7) Co-ordinated and well-considered schemes are necessary to enable local developments held over during the war to be handled on proper lines when peace is declared.
(8) The determination of questions concerning concentration of generating plant with a resulting economy of coal and other savings, requires immediate attention.
(9) That only by such steps can the electrical manufacturing industry be fully developed, not only for the home trade, but as a consequence for the great industry now maturing overseas; that the gain to the State from a well-planned scheme of reconstruction will be inestimable; and that the items which are capable of reasonable calculation, such as saving in fuel, reduction in factory costs, and increased output will together represent not less than £100,000,000 per annum.

ELECTRIC TRACTION IN THE UNITED KINGDOM.

In Section II. the committee says :—In deliberating on electricity supply the committee has had to consider the position of electric tramways and light railways, and, to some extent, the general electrification of railways. The output of electrical energy for traction purposes is already nearly 1,000,000,000 units per annum.

There are at present three methods by which powers may be obtained to construct tramways or light railways on public roads, viz., (*a*) by Private Bill; (*b*) by a Board of Trade Order which must be confirmed by Parliament; and (*c*) by procedure under the Light Railways Acts of 1896 and 1912. Much evidence was given to show that the Tramways Act, 1870, having been framed in the days of animal traction, is long since out of date, but the procedure under the Light Railways Acts, instead of being cheap and expeditious as intended, has proved to be the reverse, and that improved legislation is required. The paralysing effect of the purchase clause in the Tramways Act was illustrated by many cases given in evidence, and frequent reference was made to the report of the Royal Commission on London Traffic (1905), and the recommendations therein on the subject of the local veto.

An acknowledged traction authority urged, in advocating the establishment of an independent Board of Electricity Commissioners, that one of its most important duties should be the framing of a simplified model Bill to replace the Tramways Acts, 1870, and the Light Railways Acts. This model Bill would deal with some of the anomalies and disabilities under which the tramway industry suffers, as, for instance, recurring periods of purchase, the incidence of the burden of road repairs, periodical revision of fares, and the settlement of rating questions and running powers.

The Committee concurs with the evidence that unless there be a complete revision of the present powers, the development and growth of tramways and light railways will continue to be impeded, with a consequent reduction in the demand for manufactured products.

The electrification of railways demands consideration from a national point of view. It should be dealt with homogeneously, and not be allowed to develop in a piecemeal and desultory way. A witness of great experience stated that a return of from 10 to 15 per cent. on the capital involved could be secured from the electrical operation of some of our important railway systems. The witness added that "incidentally one may point out that probably, from a railway man's point of view, the conveniences of electric traction are more important than the direct financial results. Probably, the conveniences of the electric loconotive and the flexibility of it from a traffic point of view, will ensure its adoption more than the direct financial gain, but that does not alter the fact that I am quite satisfied from a thorough investigation of two complete systems (one a very important main line) that electric traction *per se* would pay. If that is so, then of course this country ought to develop a very prosperous industry at home, both from the point of view of the user of electrical apparatus and from the point of view of the manufacturer, and on that ground ought to have a very high percentage of the world's export business."

The committee is of opinion that such an important development as the electrification of railways, which will certainly take place in the near future, should be carried out in accordance with some settled general principle, so that all main or local lines may be properly co-ordinated, and the power-stations placed in positions which will have regard to both military and civil needs.

MANUFACTURING.

Section III. of the report comprises three and a half pages. It states that the term "electrical manufactures" is generally understood to include boilers, turbines, or engines and the electrical generators which they drive, and the mains, instruments, and apparatus connected with the distribution and consumption of electrical energy. The committee has considered the relative position of electrical manufacturing in Great Britain and in competing countries, the different conditions under which the industry has been developed in each country, and the remedial measures recommended. The manufacturing of electrical machinery and apparatus in Great Britain has been, with few exceptions, far from prosperous. Most of the companies have sustained serious losses, necessitating the writing down of capital. Tables have been put in evidence showing that thirty-two electrical firms, with an aggregate initial paid-up capital of just over £15,000,000, have been obliged to write off £3,125,000. The tables further show that few of such companies have ever earned a satisfactory return on their capital. The notable exception has been cable making, which has been consistently successful in maintaining its lead, both in the quality of its manufactures and in financial results, and has thus been able to hold its own in the world's markets.

Even allowing for mistakes inevitable at the inception of an industry, and for the rapid advance of electrical science, involving changes in types of machinery, the committee is convinced that the results would not have been so generally unfavourable but for the hampering conditions peculiar to this country, some of which are described in Section I. On the other hand, the German electrical manufacturing industry has been very prosperous. The approximate annual value before the war of the total products of electrical plant, mains, and appliances in Great Britain and Germany respectively are set out herewith :—

	Great Britain.	Germany.
	£	£
Total electrical products ...	22,500,000	60,000,000
Exports	7,500,000	5,000,000
Imports	2,933,000	631,000
Consumption of home-made machinery	15,000,000	45,000,000

The approximate annual value of home-made electrical machinery used in Germany before the war per 100 people was about £70, which contrasted with a consumption in this country of only £33. It must be noted that of the £22,500,000 manufactured in this country, a large proportion has been produced by concerns under foreign control, and in the case of British exports a proportion is known to consist of foreign manufactures reshipped as British goods. Many of the greatest electrical inventions originated in Great Britain, and there is little doubt that, as in the case of steam, our lead would have been maintained had the prevailing conditions been equally favourable, particularly as this country already possessed ample skilled labour on account of its existing engineering development. Another factor retarding electrical progress in Great Britain has been the strength of the gas interests and the influence they exerted to stifle competition.

Again, foreign governments, appreciating the importance of conserving their home markets as a basis for the development of overseas trade, imposed protective duties, and exerted influence on State departments to purchase native goods. The German Government has always been ready to help its manufacturers to extend their trade abroad. German diplomacy has been freely placed at the service of German industry, and, when necessary, has not hesitated to exert pressure in the highest quarters.

The policy of German manufacturers has been studiously directed not only to secure orders in this country under the open competition permitted by our fiscal system, but also to the effective destruction of British industry. Their business methods have been expressly designed to dominate the markets of the world, to which end they could count on unlimited support from their Government and their banks. An industry cultivated under such encouraging conditions has had an immense advantage in international competition in open markets. Such markets included the United Kingdom, the Dominions of the British Empire and the South American Republics,

Digitized by Google

whose industries had been largely developed by British capital, especially in the field of railway construction, and German manufacturers have made strenuous efforts to secure and hold those markets.

The importance of a close connection between finance and manufacture cannot be over-estimated. German financiers have always identified themselves with German industries, and it has been their custom, when providing money for a concession or contract, to enforce the use of German-made machinery. This applied not only to the original contract, but to subsequent replacements and extensions, the importance of which in a new and constantly developing field has not hitherto been sufficiently appreciated by British manufacturers and financiers.

Some British companies operating in South America have, owing to the influence of German finance, entirely ceased to purchase British goods. Many instances have been cited, including the well-known case of the Victoria Falls Company, in which orders which ought to have come to Great Britain were by financial influence secured to Germany. At the outbreak of war negotiations were in progress for the acquisition by Germany of financial control in existing companies in the United Kingdom, as well as in the British Dominions and India, which, if successfully concluded, would have still further restricted the use of British goods in many parts of the Empire.

Much of the floating finance to enable German manufacturers to secure and carry out their contracts both abroad and in British Dominions has been provided in London, so that our financiers and discount houses have often found the means by which Germany has fought the British manufacturer.

There is conclusive evidence of the existence of German control over companies ostensibly British, and that German control has also often been exercised, to the detriment of British interests, indirectly through companies incorporated in America, Switzerland, and other neutral countries. For several years there has been in Germany a consistent policy of amalgamation and association, and several establishments of world-wide importance have thus been built up. Only two or three German companies are seriously engaged in the electrical business overseas, and the competition which British manufacturers have to face is almost entirely with these houses. They have enormous financial strength, for, in addition to their own capital, they are closely bound up with leading financial institutions not only in Germany but elsewhere on the Continent, in a manner which does not exist in Great Britain.

In contrast with this policy of association, which has proved so successful both in Germany and in America, Great Britain has always discouraged combination, fearing a rise of prices to the detriment of the consumer. As a result, numbers of small concerns have arisen, each struggling against the other for bare existence. By association it would be possible to maunfacture each class of apparatus in the most suitable factory, the management of which would thus be concentrated on its own specialty instead of being wasted on a variety of products. The committee is convinced that under properly organised combination or association the cost of production will be materially reduced, and that there is no reason to fear that enhanced prices will be charged to the consumer, as a result of such combination.

If electrical factories, which are unquestionably necessary on national considerations, are to be maintained in a state of efficiency, steps must be taken at the earliest possible moment to deal with the problem. A sound and permanent industry can be established not only to supply the home market, but to secure a much greater proportion of the overseas trade. This can be done either by amalgamation among the companies or by the development of the practice of association for common purposes. An important advantage resulting from such combination would be the extension of standardisation, which the committee considers is of the highest importance from a national as well as from an international point of view. It is to be hoped that the Government will do its utmost in future to accept recognised standard plant, as its example in the past, in calling for modifications, has had a pernicious influence on other buyers. During the war makers' standards have perforce been accepted, and have been found to satisfy all practical requirements.

The necessity for protective duties has been emphasised by many witnesses connected with manufacturing interests, and has been frankly recognised by representatives of purchasers. The committee is convinced that adequate protection is necessary, and should be given at least for a period.

Great emphasis has been laid on the unfavourable conditions of railway and steamship transport in this country as compared with those in Germany, where very low export rates are quoted direct from the factory in Central Europe to destination in Great Britain, her Dominions, or other countries.

The committee considers that the preference to foreign traffic which results from our present railway and maritime rates calls for immediate correction. No railway rates on imported goods should be less per mile than the standard rate charged for similar British goods, and it recommends that it be made impossible for any steamship, whether British or foreign, which makes use of British ports, to charge lower rates to foreigners than are made to British shippers for equal distances. The committee directs attention to the report and recommendations made by the Royal Commission on Canals, and urges that greater use be made of inland water transport. The inadequate facilities for handling cargo at many of our ports should be remedied.

A better understanding between employers and employed is essential if the country is to take advantage of the business which will undoubtedly be forthcoming after the war. The committee, from its own knowledge and from the evidence given, desires to emphasise the loss that has occurred from unsatisfactory and ill-regulated working conditions, from arbitrary restrictions of output, and from opposition to the use of labour-saving machinery, resulting in a serious diminution of production. There must in the future be more harmony and sympathy between employers and employed, a general improvement in working conditions of the factories, and better provision for housing.

The committee was asked to prepare an interim report regarding measures against enemy trade to be adopted on the conclusion of peace. This interim report was submitted on October 11, 1916, and is set out in Appendix A. Evidence since received has strengthened the committee in its opinion that even more stringent means should be taken to restrict, after the war, the importation of such manufactures as can be made in British factories.

INTERDEPENDENCE BETWEEN MANUFACTURE AND FINANCE.

Just over one page is devoted to this section. The committee was asked to submit an interim report on the questions of banking and finance, as they affected the electrical industry in all its departments. This was presented on July 20, 1916, and is given in Appendix B. Electrical manufacturing is perhaps more dependent than any other on the help of a powerful financial system. The major part of its activity is connected with enterprises involving heavy expenditure which may not become immediately remunerative, and the concessionaire, inventor, contractor, or manufacturer must therefore, for such projects as the construction of a new electric railway, the electrification of an existing line, the introduction of new processes and apparatus, or the equipment or extension of a generating or transmission system, have facilities for recourse to financial organisations prepared to stand a temporary capital lock-up of considerable magnitude. In Great Britain such facilities do not exist in an adequate degree, for though she is the financial centre of the world, and can claim to be the pioneer in modern engineering, there has never been created any organised co-operation between her finance and her manufacture.

The British manufacturer suffers from another disability. He might naturally expect that when the aid of British capital is obtained the orders for the plant purchased with it would be placed at home. But, paradoxical as it may seem, he is often baulked of his hopes through the very fact that London is the financial centre of the world, and has attracted to it so many foreigners as to have created an atmosphere more cosmopolitan than national. The British financier has not only lost any sense of obligation to apply British capital for the benefit of British industry, but has allowed his activities, whether as a capitalist or a company promoter, to be constantly exploited in the interests of German industry.

In Germany a thoroughly organised alliance, offensive and defensive, has been elaborated between manufacture and finance. Banks and manufacturing concerns have common directors, and on the boards of both there sit technical and commercial experts. The German financiers do not, at the start, attempt to place an enterprise on the market as is the practice in England. Guided always by expert advice they seldom touch a project in itself unsound. They find the money themselves or through their allied groups, and, not afraid of the lock-up, wait till success is shown before they unload on the public.

An important instrument in the development of the system of so-called "peaceful penetration" has been the Schimmelpfeng Institute, a commercial intelligence agency with branches in all the principal business centres of the world, which has supplied detailed information regarding business firms to its head office in Berlin, and has practically acted as a spy system. The Board of Trade has lately made an order to wind up the business of the Schimmelpfeng Institute in this country. By these means, and by agreements with foreign concerns, the German manufacturers have secured a commanding influence in the electrical business in the neighbouring countries, notably in Russia, Italy, Belgium, and Switzerland, and if measures are not taken in time this penetration will certainly continue everywhere after the war. The balance sheets for 1915 of the Allgemeine Electricitäts Gesellschaft, the Siemens-Schückert Company, and the Bergmann Company show cash balances of 6¼, 2½, and 1¼ millions sterling respectively. This accumulation is recognised as available for peace products, and the fact emphasises the necessity for financial assistance being at the disposal of British manufacturers who, owing to excess profits duty and other taxation, find great difficulty in making provision for trade after the war.

That which has been done in the past by German financial institutions, and recently by French and American syndicates or industrial banks, could undoubtedly be achieved by one or more

Digitized by Google

British financial institutions specially concerned with engineering enterprise. Mr. Runciman, then President of the Board of Trade, made the following statement in the House of Commons on January 10, 1916 :—" The extension of commercial banking, as distinct from the more conservative form of banking which is our custom in this country, might well be fostered here. . . . If our banks cannot, in consonance with their present system, be more adventurous, let us have some additional institutions. At all events, commercial banking must play a large part if we are to hold our own against Germany." Mr. Runciman gave practical effect to his opinion by arranging for Government assistance in the creation of a bank designed to aid in the commercial and industrial development of Italy.

The committee is strongly of opinion that the establishment of industrial banks is essential not only for the purposes mentioned in the interim report, but in order to provide capital both for the reorganisation and expansion of the engineering industry. Such institutions assisted by the advice of expert assessors would help to protect the public against unsound speculative ventures, and would exercise a profound influence in placing industrial enterprise on a stronger financial basis.

IMPERIAL CONTROL OF SOURCES OF ELECTRICAL ENERGY.

Section V. deals briefly with the above subject. Striking evidence has been submitted of the manner in which German or American control has been secured in existing companies in the British Dominions and Possessions. The committee is impressed with the necessity for legislation, enacting that a company registered in Great Britain or its Dominions should, unless otherwise clearly expressed, be really British, and that no control, direct or indirect, should be exercised otherwise than by British subjects. Companies of foreign origin or under foreign control should be clearly indicated as such. It is suggested that in particular India and the self-governing Dominions should take stock of their facilities for generating electricity, whether from water-power, coal, oil, or other sources of energy, and should appreciate their permanent and ever-increasing importance to the Empire. The Canadian Government has already taken an active part in broad questions of this kind, more especially in connection with the water-power available from the St. Lawrence river.

The committee urges that electrical supply ought to be considered as a matter of Imperial importance upon which other manufacturing trades, all forms of railway traction, munition works, the production of fertilisers and other aids to agriculture will largely depend, and that the Empire's available resources for this purpose should not be allowed to pass into alien hands or under alien control. The same considerations apply to the conservation of natural products and raw materials essential to our electrical manufacturing industries.

SUMMARY OF RECOMMENDATIONS.

The committee makes the following recommendations :—

(1) A thorough reform of the legislation and conditions under which the generation and distribution of electricity are promoted and administered in this country which will involve modifications in the relevant Acts and Regulations ; and a like reform of the legislation and conditions affecting the promotion, construction, and operation of tramways and light railways.

(2) The prohibition of import of enemy goods for a period of three years after the conclusion of peace, subject to importation under licence in special circumstances after the expiration of the first twelve months.

(3) The imposition of import duties sufficiently high to protect effectively the electrical industry.

(4) The prevention of the sale in the United Kingdom of any imported electrical goods at prices lower than those current in the country of origin.

(5) The recognition of the advantage of combination among manufacturers and official co-operation with such action.

(6) The prevention of any concern engaged in the electrical or allied manufacturing industries, if controlled directly or indirectly by enemy capital, from continuing to trade within the Empire, unless it be specially authorised and its constitution made public, and the passing of legislation requiring that not more than 25 per centum of the capital in any other electrical or allied undertaking shall be held either directly or indirectly by enemy subscribers or their agents.

(7) The treatment as enemy products of all goods produced in foreign countries by concerns controlled by enemy capital or under enemy direction.

(8) The exclusive acceptance of British tenders by State Departments, public bodies and companies supplying electrical energy under statutory powers.

(9) The adoption by Government departments and public authorities, so far as is practicable, of standard types and patterns of plant and apparatus.

(10) The prohibition of transport discriminations operating to the detriment of British manufacturers, and the provision of improved transport and cargo handling facilities.

(11) The promotion of a better understanding between employers and employed and the provision of better housing and working conditions.

(12) The provision of extended banking facilities, preferably by the establishment of industrial banks, to enable British manufacturers to secure and finance contracts and engineering enterprises.

(13) The recognition of the permanent and ever-increasing importance to the Empire of the natural sources of power for the generation of electricity in the British Dominions, and the introduction of safeguards by legislation or otherwise to prevent these national assets from passing into alien hands or under alien control.

Certain further recommendations will be made in a supplementary report dealing *inter alia* with education, research, the decimal system, and the consular service.

THE REPORT ON ELECTRIC POWER SUPPLY.

In the House of Commons, on June 13, Mr. Jardine asked the President of the Board of Trade what action he proposed to take on the report of the Committee on Electric Power Supply. Sir Albert Stanley replied that the report was receiving careful consideration. It raised issues of great importance, but no time would be lost in dealing with the matter.

ECONOMY BONUS FOR L.C.C. CAR CREWS.

Acting on the suggestion of the Tramways (Board of Trade) Committee for the reduction of coal consumption, the London County Council, through the Highways Committee, have agreed, after consultation with the employees, to offer a bonus to motormen and conductors for economy of current on the following terms :—

(1) That the bonus shall be 50 per cent. of the value of the direct saving in fuel due to decreased consumption of electrical energy effected by motormen and conductors.

(2) That the saving (if any) shall be calculated from the number of units measured at the direct current bus-bars in the sub-stations compared with the number of units which would have been taken for the same car mileage at the average number of direct current units a car mile used during 1917-18. The direct-current units a car-mile for the year 1917-18 were 2·27, measured at the bus-bars in the sub-stations.

(3) That the value of the coal shall be calculated from the amount of coal burned per direct-current unit delivered to the track feeders at the sub-station at the average purchase price of fuel free alongside Greenwich power-station pier.

(4) That the value of any units purchased from other authorities shall be calculated at the same quantity and price of coal per direct current unit as if the units had been generated at the Greenwich power-station.

(5) That the bonus (if any) is to be paid to motormen and conductors (male and female) on the basis of the actual number of days worked by each individual employee during the quarter. A day's work to be counted as one day, irrespective of hours worked.

(6) That the bonus be calculated and paid quarterly.

(7) That an employee leaving the service during the quarter shall be paid a bonus based on the number of days worked, at the ascertained figure for the previous quarter.

(8) That the bonus system shall be terminable at any time by three months' notice, either by the Council or the employees.

It is anticipated that if a saving of energy consumption of 10 per cent. could be effected by the drivers, at the present average price of fuel there would be a saving in the cost of coal of about £6,350 a quarter ; 50 per cent. of this saving distributed equally to the drivers and conductors would represent a sum of about 12s. 5d. a quarter a head. It has been made clear to the employees that this bonus must not be regarded as part of their wages, and that it does not come within the category of matters within the purview of the Tramways Conciliation Boards. No bonus will be paid unless a saving in fuel is effected, and the Council, whilst realising nearly half of any saving made, will in addition obtain other equally important benefits, e.g., reduced wear and tear in car equipment and plant generally, reduced loading of the cables (many of which are at present overloaded), and a reduction of the peak load at Greenwich generating station and on the sub-stations.

THE LIGHT RAILWAY COMMISSION.

In a statement circulated by Mr. Bonar Law on June 13, it was announced that the Board of Trade, after careful consideration of the recommendation of the Committee on Retrenchment that the Light Railway Commission should be wound up, had decided, after consultation with the Treasury, to continue the powers of the Commission for the present. The Light Railways Act of 1912 was accordingly included in the Expiring Laws Continuance Act last session. This had been done in view of the difficulty under existing circumstances of forming an opinion as to the best method of dealing in the future with the question of light railways. A small staff of the Commission which remains is employed to a considerable extent on important duties in other departments of the Board of Trade.

Digitized by Google

MUNICIPAL AND COUNTY ENGINEERS.

PAPERS ON TOWN PLANNING, ROAD, AND TRANSPORT QUESTIONS.

The 45th annual general meeting of the Institution of Municipal and County Engineers, held in London on June 20 and 21, proved very successful. Ordinarily the summer meeting is held in the town of which the president-elect is the engineer, and therefore this year's meeting should have taken place in Battersea. Circumstances over which the authorities of that borough had no control made a conference at Battersea impossible, and so, by the exercise of that courtesy which is never wanting amongst Metropolitan Mayors, the Mayor of Battersea was enabled to welcome the delegates at the hall of the Institution of Civil Engineers. The attendance of delegates was above the average, and the visit of the President of the Local Government Board added to the importance of the gathering. Mr. P. H. Palmer, borough engineer of Hastings, as president, took the chair at the annual meeting. The report submitted dealt, amongst other matters, with the question of the status of engineers, and stated that the joint conference of the Society of Engineers and the Institution had prepared a report, which will be submitted to the Local Government Board.

Mr. P. H. PALMER proposed the adoption of the report, and said that he saw no reason why the institution should not attain to as good a position, and be as much recognised, as the Institution of Civil Engineers.

Mr. T. W. A. HAYWARD seconded the motion, which was carried.

After a welcome from the MAYOR OF BATTERSEA, Mr. T. W. A. Hayward, municipal engineer of Battersea, was installed as the new president, and a graceful compliment was paid him when the Mayor presented him with a framed illuminated copy of the resolution of congratulation which had been passed by his Borough Council on his election to the office.

A vote of thanks was accorded Mr. P. H. Palmer, the outgoing president, and then Mr. HAYWARD delivered his presidential address, which dealt generally with the work of the municipal engineer and the need for training. He emphasised the importance of the municipal engineer having fixity of tenure.

The Right Hon. W. HAYES FISHER, President of the Local Government Board, addressing the members at the afternoon session, pointed out the important part that engineers would be called on to play in the reconstruction of the world at the end of the war, and in this connection he dealt with the Government's policy in regard to the building of working class houses. That policy could be helped or hindered by municipal engineers, and he believed they would help. On the subject of the State building, he said if the State did attempt to house the workers they would necessarily have to go to the local authorities on such questions as sewerage, water supply, and transport, and the latter subject was one of especial importance in the proper housing of the masses. In all these things the dominating factor was finance, and no one could say what would be the value of money at the end of the war. The speaker aroused enthusiasm when he declared that this country and its Allies held the keys of the cupboard containing the raw materials of the world, and if they gave those materials to those who had helped to build up instead of destroying, the skill and energy of the people of this country would make Great Britain a more valued and blessed possession.

On the subject of town planning and transport, four papers had been prepared. The first, by Mr. A. HORSBURGH CAMPBELL, dealt with the difficulties encountered under the present Town Planning Act, the author pleading for the complete recission of the existing procedure regulations and the substitution of a shortened code of regulations in harmony with the simplicity and spirit of the Act itself.

Mr. J. W. COCKRILL (borough surveyor, Great Yarmouth) dealt with the subject of "The Official Housing and Town Planning Act, 1909," and asked who was so capable of carrying out the provisions of the Act as the official who was in daily touch with the technical work of his district. At the same time, he agreed that occasions would arise when it would be desirable to call in an expert on some æsthetic or technical subject.

Mr. D. M. JENKINS (borough engineer and surveyor, Neath, in the course of his paper on "Regional Planning," emphasised the need for regional as against piecemeal planning. What was required, as the condition precedent to town planning, was a large scale consideration of the kind of development that best suits a whole group of areas. Such consideration should extend not merely to housing, but also to new and improved road communications, transport facilities, and the provision of central power-stations. The large increase after the war of road transport for short distance traffic was confidently anticipated. Its development would be stimulated largely by the general supply of cheap forms of power; and this again emphasised the necessity for regional planning of and control of roads, and of providing and maintaining a system of well-designed and equipped arterial roads.

BIRMINGHAM'S NOTABLE TRAMWAYS PROPOSALS.

The paper of Mr. H. E. STILGOE (city engineer, Birmingham) was perhaps the most practical contribution to the debate, inasmuch as he was able to show what has been done at Birmingham in regard to main roads and in respect of town planning schemes carried through. By the extension of its boundaries Birmingham has included a great deal of what is rural country, and provision is to be made for the construction of roads of sufficient width for future needs, and of subsidiary roads and tramways for the development of the districts. The City Council has approved the proposal that 110 ft. shall be fixed as the minimum width of streets of something like a mile from the centre of the city, and 120 ft. as the minimum width onwards to the boundary. At present tramways are laid in practically every one of the arterial roads running towards the centre of the city; these tramways are fed by tramways in other streets, also by motor omnibuses. Whether tramways or omnibuses or some other form of cheap conveyance would be employed in the future they could not say; it was, however, certain that there was nothing likely to be produced which would be cheaper, from the point of view of tractive effort, than a steel wheel on a steel rail. Assuming, then, that the tramway was to remain, it was of great importance that the present cost of maintenance of the track and the rolling stock should be reduced. The average cost of repairs and reconstruction of the tracks in the streets approaching the centre of the city amounted to about £650 per mile per annum, which worked out at about 1s. 6d. per square yard of track surface per annum, which, if capitalised at twenty years' purchase, amounted to 30s. per square yard. It was estimated that about 75 per cent. of this amount would be saved if sleeper track were adopted, and this, together with the saving on the initial cost of construction, should be set against the cost of the extra width of land required to provide for the independent sleeper track. The rigidity of a tramway, as at present constructed in the carriageway, was contributory to its own destruction and to that of the rolling stock. A street tramway, when forming part of the carriageway, must of necessity be rigidly laid, but when constructed on the same principle as a permanent railway, namely, on separate track on an elastic bed such as was furnished by rails laid on sleepers and ballast, the maintenance of the permanent way was reduced to a minimum, and the life of the rolling stock was considerably increased; further, the cost of the original construction was much less.

OTHER ADVANTAGES OF SLEEPER TRACK.

There would also be a great gain in the matter of speed, as the tramway, being on a track separate from the carriageways, the ordinary vehicular traffic travelling along a road could not get into the way of the cars; the consequent increase of speed would be not only an advantage to the travelling public, but would mean more economical working of the tramways. Another advantage would be the lessening of the noise, as nearly all the noise from cars ordinarily arose from "hammered" rail joints, due to rigid construction of track. An independent track on sleepers would be more elastic. A further advantage was that if in the future it was decided to increase the gauge of the tramways from 3 ft. 6 in. to 4 ft. 8½ in., it could be done upon the separate sleeper track system with comparative ease and low cost upon the width provided in this scheme. Therefore in considering the width of arterial streets, sufficient width for a separate track for the tramway should be provided; the only practicable position for this in a shopping or business street was in the centre; consequently it was necessary to provide a carriageway on either side.

The minimum width required for tramways on sleeper track is 27 ft. for the track and 24 ft. for each of the two carriageways, making together 75 ft. between the footpaths; the footpaths to be 17 ft. 6 in. each, giving a total street width of 110 ft. The 27 ft. of tramway track provides the necessary standing room for passengers; the two footpaths should be not less than 17 ft. 6 in. each, to provide for pedestrian traffic and the laying of service mains. In the portions of the arterial roads more remote from the centre of the city, where land is cheaper, a minimum width of 120 ft. is recommended; the extra 10 ft. provides for trees in the tramway track and on the footpaths. This additional width is the minimum to obtain the object in view. The width of 120 ft. for a suburban arterial road and tramway should be taken as the minimum, and not as the maximum. Provision was made for a central tramway track 33 ft. in width, a carriageway on either side, each 24 ft. in width, and a footpath 19 ft. 6 in. wide (with or without a grass margin and trees) between each carriageway and the forecourt. The minimum width of 27 ft. for the track did not permit of the planting of a hedge or row of trees on either side; where the hedge or trees were planted, 33 ft. is the minimum, and 42 ft. would be better; but if 120 ft. was the total width of the street, then the footpaths would be reduced to 15 ft. each, which was not sufficient in all cases. The large double-deck cars in the city carried from 52 to 60 passengers. At the present time a single-deck car was being experimented with in Birmingham; if the single-deck cars eventually took the place of the double-deck cars a greater number of cars would be necessary to deal with the traffic. On the other hand, assuming that motor omnibuses or some such vehicles

Digitized by Google

were to supersede cars, it was obvious that a greater number of vehicles would be required ; the double-deck omnibuses carry about 34 and single-deck omnibuses about 25 passengers. There would appear to be a general tendency to build smaller omnibuses rather than larger, and this again meant more vehicles. The point for consideration was the number of vehicles and the carrying capacity. If tramways were constructed as at present in Birmingham—as a part of the carriageway of the street—it was certain that the number of cars would increase, and therefore adequate space must be provided in the arterial streets for other vehicular traffic.

A number of speakers took part in the discussion, but their remarks were almost entirely confined to the questions of procedure under the Act and the regulations.

Road Maintenance after the War.

The road problem was the feature of the papers and debates at the concluding sitting.

Sir George Gibb, chairman of the Road Board, attended, and had a cordial welcome. He said the nationalisation of roads would merely mean the substitution of one form of local government for another. The State, in taking the control of roads out of the hands of the local authorities, would have to shoulder the whole of the cost—a disastrous policy for which no sound reasons could be advanced. There would, of course, be certain advantages associated with the standardisation of roads, but he was convinced that this result would be best achieved by maintaining the existing system of local control of roads. Co-ordination was preferable to Government control. To get good roads there must be good surveyors, and to get good surveyors authorities would have to pay good salaries. There was bound to be a heavy expenditure on roads after the war. That was why he advocated the policy of saving money, so that funds would be available later. The Road Board had saved money, but there was not enough available to do all that would be desirable. The war had had a bad effect on roads through excessive traffic, but on the other hand there had been a diminution of certain kinds of traffic which to an extent compensated for the increased military traffic. But he had been surprised to find how good was the state of many roads which had been subjected to heavy traffic. Though there had been an intense growth of military traffic on some roads, yet had there been no war there would have been a general increase of traffic. Sir George declared that a progressive people would have good roads, and many of them adapted to the needs of each locality, and they would not be particular about uniformity of pattern. The splendid road system of this country was the creation of local enterprise, and to that it owed its variety and its adaptation to the circumstances and needs of each locality. The general conception of their system of highway administration was a sound one, but modern developments had created an imperative need to make some changes, and to find the best ways of meeting new requirements. There would in the future be a great expansion of motor traffic, and roads must be made fit to carry the new traffic. This was a problem which presented no great difficulty, except that of increased cost. The first step towards reform was to get a proper classification of roads. The Road Board was engaged in settling such a classification when the war broke out. All roads of the metropolitan area would be classified as first, second, or third class, according to the importance of each section or a unit in a complete system of road communication. In conclusion, Sir George insisted that the Government should give greater help to local authorities towards the maintenance of main roads.

Mr. Brodie (city engineer, Liverpool) said the roads of this country prior to the war were admitted to be the best in the world. They would have to carefully examine any proposals for changes of policy. Central control was in the air, but experience had not convinced them that central control was a first-class thing. Possibly there might be a solution in a combination of central and local control.

Mr. Brownridge agreed that co-ordination would be desirable. Good roads were of vital importance to the country. There was need for supplementing local efforts. Indeed, a national effort was needed in the direction of improving and making main roads. Surveyors were looking to the Road Board for aid after the war when roads would have to be dealt with. Meanwhile local authorities should be preparing.

The President (Mr. Hayward) recalled that Sir George Gibbs was criticised when he was appointed, but experience had proved him to be the right man to be the chairman of the Road Board.

Mr. Greaves (Sutton) said the day of the waterbound road was over. On main roads there should be culverts for mains, to prevent the frequent breaking up of the roadway by gas and water companies.

Mr. Brodie, interposing on this subject, urged that money spent on waterbound roads would be more wisely spent on permanent roads.

Mr. Stilgoe (Birmingham), alluding to clinker mexphalte roads, said that one he had constructed a year ago was wearing well, though its construction was costly, owing to war conditions. He agreed that waterbound macadam should be reduced to a minimum.

Mr. Price declared that it was possible to make tar macadam roads equal to asphalte roads if proper care were taken in the construction.

Mr. Cockrill said waterbound macadam was the dearest method of construction. Tar went a long way to economy in road maintenance.

Mr. Dryland (Surrey) urged surveyors to keep records of their roads in order to compare and test experiments and experiences.

Mr. Bainbridge said the ordinary waterbound road was out of date, though it might be useful where there was no traffic.

Captain Frank (Durham) said authorities needed power to acquire land with greater facility for road widening.

Mr. Roberts (Worthing) urged surveyors to make greater use of tarred clinker. After thirteen years' experience Worthing was still making tar-clinker roads.

Mr. Gedding (Worcestershire) said concrete was necessary for heavy traffic, though its cost at the moment was prohibitive. Consolidated slag, however, had proved equal to concrete when properly laid.

Mr. Harwood spoke of the need of local traffic statistics, so that reliable road wearing comparisons could be made.

Lorry Speed—Four-Wheel Drive Less Destructive.

Major Phipps said he was surprised, on returning from France, at the speed which lorries travelled over the roads in this country. The limit in France was eight miles an hour, but here it was about sixteen, and it should be reduced, because high speed caused great damage to the roads. The authorities did not realise this fact sufficiently. In France he observed that the four-wheel drive vehicles did less damage to roads than the two-wheel drive vehicles. The opinion of engineers in France is that in the future there would be such heavy motor traffic in this country that some form of granite sett paving would be necessary.

The President mentioned that in Battersea there were tar-macadam roads now as good as when the roads were made fourteen years ago. The roads, of course, had had to be looked after. As regarded clinker, it had to be remembered that clinker varied in different districts, and was not in all places suitable.

Dealing with the growth of London, Mr. W. R. Davidge said that in the reign of William and Mary the London householder was required to have the street in front of his house swept twice a week under a penalty of ten shillings, and to do his share of street lighting by hanging out a lantern. The great era of road improvement came about in the middle of the eighteenth century, when the turnpike roads were created. The general Turnpike Act of the eighteenth century even insisted on roads at least 60 ft. wide. London was seven times bigger than it was a century ago, and was spread over an area seventy times bigger.

Mr. A. Dryland (Surrey), in some notes on traffic and roads, gave a hint of the future in the way of road traffic. He thought it might be taken as certain that heavy haulage of all types would develop rapidly. The shortage of horses had turned everybody's thoughts to substituting mechanical haulage, and this had been done to a great extent even during the war. What with the thousands of lorries returning from army service, which would come largely into use in aiding the "arts of peace" instead of war, the waiting lists all manufacturers of heavy vehicles had, and the immense enlargement of output of this type of vehicle developed during the war, the number of the heavy haulage vehicles to be provided for would go up by leaps and bounds. The railways would be in such a state of deterioration, and have such a shortage of rolling stock, that it would take some years to restore them to their pre-war condition, and this would enhance the demand for road traffic. It certainly looked as if municipal engineers were up against a tough task. The deteriorated road crusts, which would take some years to restore even to their former sound condition, would be tried as they had never been before, and by the most damaging factor among road destroying vehicles. There was no doubt that heavy motor vehicles were the most damaging of any on our roads to-day. The effect of the omnibus had demonstrated what a trying form of traffic it was, and most of the additional traffic would be of a heavier type than these, and would probably attain greater average speeds because of the lesser number of stoppages. It was a common experience on country roads to find vehicles of over 5 tons weight unladen, and with perhaps a load of another 5 tons, travelling at speeds exceeding 20 miles per hour, and the effect of this speed and weight combined needed no emphasising.

Need for Larger Wheel Diameter.

He expressed the view that regularity in the diameter of wheels was a strong factor in stereotyping corrugations. If there had been a greater variety in wheel diameter, and particularly a good proportion of those of a larger diameter, their troubles, past and future, would be less. The exigencies of the roughness of the track might yet drive the motor industry to adopt a larger wheel diameter, as smoothness of travel was a prime factor in economical maintenance of vehicles. Dealing with another feature of the growth of heavy haulage, Mr. Dryland said he was impressed with the tendency of the heavy vehicle to keep well to the side of the road, a tendency

Digitized by Google

to be encouraged, but bringing with it an additional strain on what was, in the country, almost invariably the weaker part of the road. The slight tilt of the vehicle, from the necessity of the road camber, put further weight on the extremities of the road width, and he strain where there was least counteracting support. It would be necessary to strengthen the haunches by kerbing, which meant a large expenditure hitherto deemed unnecessary for country roads.

In some points on road construction, Mr. G. GREEN (Wolverhampton) alluded to the virtues of clinker for road construction.

War's effects on traffic were described by Mr. E. P. HOOLEY (Oxford), who said that the taking away of 75 per cent. of the available steam rollers, traction engines, self-propelled tractors to another sphere of usefulness, in great measure returned the surveyors to the days of the Victorian era. The difficulty of obtaining road material equally returned them to the days when each member of the old Highway Board begrudged the necessary material for efficient management because " the roads were good enough for farm traffic," and to those " wise men " " farm traffic " seemed nearly all that the roads were ever intended or likely to carry ! It could hardly nowadays be appreciated that in 1881 steam rollers were looked upon by very many as the expensive toy of the amateur road-maker, or the fool's paradise tool of the enthusiastic reformer. Undoubtedly, he insisted, self-propelled traffic was yet in its infancy, and the advent of cheaper cars for light use and the great advantages of heavy and light tractor traffic for business purposes would call for permanent roads or greatly increased cost of present roads.

Mr. J. D. WEBB dealt with roads in rural areas, and referred to the damage by farm wagons. He declared that the condition of the traffic now using the highways necessitated altered methods of construction and maintenance of road surfaces, as many of the highways in rural areas were subjected to both heavy and fast moving traffic, motor omnibuses, etc. Both heavy motor lorries and fast-moving vehicles seriously affected the road surface, by disintegration and corrugation, particularly by improperly balanced vehicles, method of construction, position of the springs, type of tires, excess weights, width of wheels, and various other factors. Many of these effects could be minimised in an improved construction of vehicles, but this no doubt would be an accomplished fact in the near future. It would appear almost incredible that some roads in rural districts were subjected to traffic exceeding 500 tons per yard superficial in twenty-four hours, figures confirmed by census of traffic recently taken.

Mr. GLADWELL (Norfolk) declared timber haulage to cause more damage to road surfaces than any other form of traffic.

BUILDING UP WORN RAILS.

ONE OF SEVERAL NEW SOUTH WALES DISCOVERIES.

The Chief Commissioner of the New South Wales Government Railways and Tramways has reported upon the experiments conducted by a special committee appointed shortly after the outbreak of war, with a view to discovering a method of producing manufactured accessories locally for the construction of rolling stock.

The discoveries of the committee comprise a locomotive superheater equal to any produced in any part of the world ; steel railway axles superior to Krupp's ; steel railway tires which have demonstrated by actual test satisfactory life ; a new type of Australian boiler plate ; the utilisation of a substitute for tin ; and the invention of a method of building up worn tramway rails and crossings, so as to make them again useful several times. Accessories for rolling stock construction have been imported by the Railway Department of New South Wales in common with the Railway Departments of other States. For years the expenditure on steel axles, tires, and boiler plates alone have reached millions of pounds sterling, all of which money has been going out of the country, and the bulk of it to Krupp's, in Germany.

Tests have shown also that the tires, axles, and wheels made from Australian steel at Everleigh are in every way superior to the Krupp products, and the cost is a great deal lower.

Thermit, Limited, 675, Commercial Road, London E., inform us that the whole of the company's shares which, in August, 1916, were sold by the Public Trustee to the Birmingham Metal and Munitions Company, Limited, have now been taken over by Nobel's Explosives Company, Limited, Glasgow, and under the new auspices the activities of Thermit, Limited, are being considerably extended. The company own many valuable patents connected with the engineering industry, and by their scientific application are enabled to execute certain classes of work by methods other than those usually adopted. The company have a highly trained staff of chemists, engineers, and workmen, and are specialising in the manufacture of high-grade metals and alloys in connection with munitions ; also welding in all its branches by up-to-date methods, and engineering repairs generally. In principle the Thermit reaction is no doubt familiar to our readers, but the success of the process demands a good deal of practical experience based on scientific knowledge. The company is now wholly British, to the entire elimination of all enemy interests.

PERNAMBUCO TRAMWAYS COMPANY.

DIVIDEND-PAYING STAGE REACHED.

The sixth ordinary general meeting of the Pernambuco Tramways and Power Company, Limited, was held on June 25 in River Plate House, London, E.C., Mr. William Higgins in the chair.

The Secretary (Mr. H. Tattam) having read the notice convening the meeting, and also the report by the auditors,

The Chairman, referring to the absence of Mr. Follett Holt (chairman of the company), said that this was due to Mr. Holt having been asked by the Government to form part of an important diplomatic and commercial mission which recently left these shores for South America. The shareholders would agree with him that Mr. Holt could not refuse this opportunity of assisting his country. The directors felt that his services would prove of value to the Empire.

Moving the adoption of the report and accounts, the chairman said that the incorporation took place on January 24, 1913, and their construction programme was proceeding rapidly when war broke out in August, 1914. Since then their efforts towards completion of the original programme had been retarded, and the period from the outbreak of war had been one of considerable anxiety. Notwithstanding these troubles and difficulties, however, the confidence of the directorate in the ultimate success of the undertaking was slowly but surely being confirmed. The past year had been one of continued progress and development in every branch, and had it not been for the existing abnormal conditions, dividends might have been earned on both classes of the share capital. Nevertheless they were glad to be able to recommend a payment that would commence the dividend-earning period in their history. The operating results showed a net increase over those of the previous year of £27,127, and this result would have been considerably increased had it not been for the extraordinary rise in the price of practically every item required in the successful working of such a company.

The tramways receipts had shown, and continued to show, a progressive rate of increase. The whole of the systems of the old mule tramways and the Brazilian Street Railway had now been electrified, and an electric tramway connection had been established with the important suburb of Olinda. They remained with just over eight miles of steam lines, being part of what used to be the Olinda Street Railway. Notwithstanding the enormous rise in the price of coal, the gas undertaking had shown a profit. The improved plant laid down in the retort-house had enabled the management to make great economies in the amount of coal carbonised. At present they were carbonising some 3,750 tons per annum, a saving of about 50 per cent. of coal. In ordinary times coal would have cost £2 per ton. The price last year was £5 15s. and at present it was £8. Bearing these figures in mind, it was evident that the directors were justified in anticipating a remunerative future for this branch of the business when the war was over and circumstances and prices again became normal. The new gasholder enabled them to provide customers with the steady pressure so much needed, and had aided materially in building up the business by the sale of gas for heating and industrial purposes.

With regard to the supply of current for lighting and power, the chairman last year anticipated that during 1918 they would see some good results from this branch. The directors still hoped that this anticipation would be realised, but they met with the greatest difficulties in obtaining the material to carry on the work, and, even when they had obtained it, great delays had arisen in getting shipping permits. At present all endeavours were being made to supply their requirements as speedily as possible, and once the material arrived the process of erection would be speedy. There was a great demand for electric current in Pernambuco, and as soon as they were in a position to supply their customers good and improving results could be anticipated. The Telephone Company continued to show satisfactory progress, and the result of the better service had shown itself in the increased number of subscribers, and consequently in the improved receipts. It was also satisfactory to report that they had enjoyed during the year a better rate of exchange, averaging 12·81d., as against 12·06d. in 1916. With regard to the future, the prospects were satisfactory. Since the commencement of the year there had been every week an increase in the traffic receipts from the tramways, the total increase to date being approximately £22,000. The net results of working, so far as the directors knew them, also showed a distinct improvement compared with the corresponding period of 1917, and they had no reason to suppose that progress would not continue as the business developed. The city of Pernambuco was being brought up to date under the supervision of its progressive and go-ahead Government. For many years it jogged along with its more or less primitive methods of transit and with what could only be termed antiquated gas lighting facilities. To-day all this was changed. This company had supplied a modern system of tramways and up-to-date gas installations, and they hoped in the near future to be able to provide the current for electric lighting and power. It was satisfactory to know that their endeavours to meet the public were appreciated.

Mr. H. K. Heyland seconded the motion, which was carried, and a dividend of 3½ per cent., less income-tax, was declared on the 7 per cent. cumulative participating preference shares.

Digitized by Google

SIEMENS BROTHERS AND COMPANY, LIMITED.

AN ALL-BRITISH CONCERN.

The ordinary general meeting of Siemens Brothers and Company Limited was held on Tuesday, June 11, at Winchester House, Old Broad Street, E.C., Mr. G. Mure Ritchie, the chairman, presiding.

The Chairman said that during the past year the company had adhered to its past policy, and the volume of the business done exceeded that of 1916 by about one-third. The expansion in output occurred principally in insulated wires and cables, ebonite, and batteries. In regard to the development of automatic telephony, which the company foresaw before the war, the advantages of eliminating the human exchange operator had been demonstrated in practice, and all technical difficulties surmounted, and they were equipped to provide large exchanges for public service and also private exchanges of 25 to 500 lines. Notwistanding the demands of war work, they had completed a semi-automatic exchange of 1,000 lines at Port Adelaide for the Commonwealth of Australia, and a full automatic exchange of 1,300 lines at Grimsby for the G.P.O., while good progress has been made with a full automatic exchange of 950 lines for Stockport, also for the G.P.O. Many private exchanges had been established in munitions factories, and had given every satisfaction.

SUBSTANTIAL INCREASE OF PROFIT.

After speaking of the cordial relations existing between the company and the workpeople, the chairman went on to say that the year's profit of £208,524 showed substantial increase over that of 1916, due to the very much larger volume of business done. An interim dividend of 10 per cent., free of income-tax, had been paid, but no further distribution for the year 1917 could be considered until the Government claim for excess profits duty had been adjusted.

The balance sheet showed £764,524 for materials, manufactured goods, and work in hand. This was more than double the pre-war amount of £377,385, the increase being due entirely to the growth of expenditure on orders in hand, which at December 31 exceeded in value £1,500,000.

An important asset was the holding of the entire issued capital of Siemens Brothers' Dynamo Works, Limited, namely, £200,000 in shares and £200,000 in debentures. At the outbreak of war the share capital of Siemens Brothers and Company, Limited, was £600,000, with £150,000 of 4 per cent. debentures, nearly all the shares and about one-third of the debentures being held by Germans. Moreover, the German shareholders had supplied funds to meet the capital requirements of the growing businesses of the two companies. When war began the entire German interest in the shares and the additional capital referred to was vested in the Public Trustee, who took steps to realise it by sale to a British buyer, and on December 14, 1917, the share capital of Siemens Brothers and Company, was purchased by Messrs. C. B. Crisp and Company. The contract provided for the issue to the Public Trustee by the company of £1,330,000 of 4½ per cent. debentures to provide for the repayment of capital (other than share capital), and the participation in the 4 per cent. debentures employed in the business by the former German owners; and the Public Trustee had a right after the conclusion of peace to call for the redemption of these debentures on one year's notice. Subject to such arrangement, they were redeemable by annual drawings calculated to extinguish the whole in twenty-five years from the date of issue.

BOARD RECONSTITUTED.

Following this arrangement with the Public Trustee, the Board was reconstituted, and now consisted of Mr. G. Mure Ritchie (chairman), Sir William Bull, M.P., Sir Clifford Cory, M.P., Lord Queenborough, Mr. H. J. Thomas, and Mr. G. Chauvin (managing director). The new board had devoted attention to many questions concerned with the development of Siemens Brothers into a great national manufacturing asset, leaving little time for discussion of a scheme of rearrangement of the share capital. The board, however, recognised the advisability of changing the capital arrangements so as to establish equilibrium between share capital and debenture debt, and at an early date the shareholders might be asked to approve a scheme for increasing the share capital to £1,500,000 (or even more) in £1 shares, of which a substantial portion would remain in reserve for future developments; but as to £400,000, if issued for cash, the proceeds would be available for the retirement of a corresponding amount of debentures. If the matter were carried through on the lines thus indicated, the joint concerns—Siemens Brothers and Company and Siemens' Dynamo Works—would be represented by an issued share capital of £1,000,000, with £150,000 of 4 per cent. debentures and about £1,000,000 of 4½ per cent. debentures, the latter being held by the Public Trustee. These readjustments were all subject to the consent of the authorities concerned, but he could go so far as to say that, as the Board of Trade wished the company to be so assisted as to ensure its future expansion in British hands, they were justified in believing that symapthetic consideration would be given by the authorities to their proposals for the financial reconstruction of the company when they were put forward.

WAR LOAN PURCHASE.

Dealing with Siemens Brothers' Dynamo Works, Limited, entirely owned by Siemens Brothers and Company, the chairman said that the turnover in 1917 increased in the United Kingdom and decreased overseas as compared with 1916. The value of unexecuted orders on December 31 was £1,145,000. Siemens Brothers and Company and the Dynamo Works had purchased £50,000 of War Loan, and had provided several thousands of pounds to give temporary assistance to War Savings Associations for the workpeople.

Since the entry of the new directors into office, negotiations had been inaugurated with other companies doing similar industrial business with the object of bringing such manufacturers together for the reduction of unnecessary competition, and the avoidance of duplicating machinery, workshops, and offices. Co-operation would make for the more continuous running of plants, with the attendant advantages of cheaper production, increased efficiency, and improved quality of the work done, avoiding unnecessary expense in storage, selling organisations, and reducing the duplication of stocks to a minimum. An even more important advantage aimed at was the amalgamation of designing offices and interchange of experience, designs, and methods, to the promotion of economy and efficiency. Such industrial alliance would, moreover, make it possible to carry out complete installations within the allied group. An alliance of this nature had already been arranged with Messrs. Dick, Kerr and Company, Limited, in the field of dynamo installations in all its ramifications, and other alliances were contemplated. He moved the adoption of the report and accounts, and the motion was unanimously carried.

A vote of thanks to the chairman concluded the proceedings.

BRITISH ELECTRIC TRACTION COMPANY.

The report for the year ended March 31 shows a gross profit of £237,906, against £226,745. After deducting general expenses and amount written off sundry assets, £28,685, there remains £209,221; £97,598 was brought forward, making £306,819. Debenture interest absorbed £90,979, leaving £215,841. The directors recommend a dividend of 6 per cent. for the year on the cumulative participating preference stock (on account of which £21,382 has already been paid), a dividend of 3 per cent. for the year on the ordinary stock, to place to reserve £21,172, and to carry forward £112,116. The net profit shows an increase of £9,249. The aggregate receipts of the associated companies show an advance, but the wages paid and the cost of materials have also increased, and larger provisions have been made for future repairs and maintenance. In the Metropolitan area war conditions generally have had a prejudicial effect. The question of increasing the statutory fares on tramways and light railways was under the consideration of a Select Committee of the House of Commons. The amount standing to the credit of reserve account at March 31, 1917, was £425,000, to which has been added £3,828 in respect of debenture stocks purchased and cancelled. With the proposed allocation of £21,172, the reserve will then amount to £450,000. Investments now stand at £4,262,958, and yielded a revenue of £210,361, representing an average of 4·93 per cent. on the amount at which they appear in the balance sheet, against 4·79 per cent. At March 31 there were uncalled liabilities on investments amounting to £42,901.

Mr. E. Garcke presided at the twenty-second annual meeting, held on June 26, at the Manchester Hotel, E.C. In moving the adoption of the report, the chairman said that the position presented the same general features as it did last year, but they were intensified. They had made more profit, because they had done more work, and having done more work they had had greater difficulties to overcome. The increased profits made by the associated companies had been applied mainly to strengthen the financial position. Referring to the report of the Board of Trade Electrical Trades Committee in regard to the position of the electrical trades after the war, to the report of the Coal Conservation Sub-Committee of the Ministry of Reconstruction on electrical power supply, and to the report of the committee appointed by the Board of Trade to consider the question of electrical power supply, the chairman said that they deserved careful attention by all who had invested capital in the industry. The three reports were a condemnation of the electrical legislation of the last thirty-six years and a vindication of the men who had persistently opposed this legislation and its tendencies. The condition of the electric industry before the war was ludicrous, for it was lamentable to contemplate the many years of effort spent in surmounting unnecessary obstacles. The general result was expressed in sparse profits, which meant low wages, inability to make research and unwillingness to undertake extensions. German manufacturers, who had a protected home market because they were encouraged by their Government, were able to compete in this country, and they were invited to do so by our municipalities. The conditions were bad for the manufacturer, but much worse for tramway and electric supply undertakings, which were surrounded by Acts subjecting them to the municipal veto. They were now told that cheapness had not been an unmixed blessing, and that trade combinations were not an unmitigated evil. The explanation

Digitized by Google

was that in the past politics had determined policies, while during the war urgency and efficiency had dispensed with the normal forms of legislation and procedure. The prevailing feeling now was that restrictions must be removed; that facilities for new enterprise and for extensions must be provided; that competition, and especially enemy competition, must be excluded, and that capital invested in the industry must be allowed to fructify, so that labour could be adequately paid; that inventors might be encouraged, and that the highest technical talent might be attracted to the production of electrical machinery and distribution of energy. If the problem was tackled in a comprehensive and equitable manner after the war was over, the electrical industry would prosper to an extent and in ways that would surprise many of its supporters. Sir E. Ollivant seconded the resolution, which was agreed to.

ANGLO-ARGENTINE TRAMWAYS.

At the 34th ordinary general meeting of the Anglo-Argentine Tramways Company, held on July 1 at Winchester House, E.C., Mr. W. F. Hamilton presided in the absence of the chairman of the company, Mr. J. B. Concanon, through illness.

The Secretary (Mr. W. D. Dawes) read the notice convening the meeting and the report of the auditors.

The Chairman said that the manager, in forecasting the results for the year 1917, stated that if they maintained the traffics of the year 1916 it was about as much as they could expect. It was therefore satisfactory to note that the traffic receipts, which were £2,652,468 in 1916, were in the year under review £2,700,244, and this in spite of the serious labour troubles which took place. Hitherto they had expected increases in traffics to arise from the natural growth of the population of the city, which in pre-war times was nearly 70,000 inhabitants annually, and it was therefore satisfactory to know that now, although the population was stationary, or inclined to decrease, they had added to the receipts £47,776.

Subway's Popularity—Paving and Renewals.

As regards the subway line, during the last five months of the year the receipts showed an increase. This line had become a favourite means of transport; rents were high in its neighbourhood, and any vacant houses were rapidly snapped up. The most careful attention had been paid to the upkeep of overhead lines, permanent way, and rolling stock; £248,754 having been spent during the year on maintenance. Important economies had been made, especially in the construction of track, and the good condition of the rolling stock was shown by fewer breakdowns and consequent delays. The company's properties had been maintained in a good state of repair. The auditors had drawn attention to the amounts set aside as reserves for paving and renewals, to which no material addition had been made since the commencement of the war. In 1914 a scheme for making the necessary provision for paving was settled with the approbation of the auditors, and had since been adhered to. It was true there had been since the year 1913 an addition of only £12,000 to the renewals reserve, but so long as the company was spending out of revenue large sums annually for the maintenance of the property in good condition, the board did not feel justified in these difficult times in adding more to these reserves than the technical advisers considered absolutely necessary. In not recommending any payment of dividend on the first preference shares for the second half-year, the directors had had regard to the cost and the difficulty of obtaining fuel.

Fuel and Taxation—Relations with Employees.

But for the war coal would have been about 30s. per ton delivered in Buenos Aires. The cost has risen to over £8 per ton. Under the power contract the charge for electric energy increased with the price of fuel when it exceeded about 30s. a ton. The price per unit had thus increased by nearly 200 per cent. At pre-war prices for the current consumed in 1917 they would have had an additional sum of £319,000 for distribution in dividends, and this would have paid not only the balance of the dividend on the first preference shares for the second half of the year, but also the whole of the second preference dividend and a small dividend on ordinary shares. To guard against a further increase in the cost of current the Board have carried forward the balance of £17,021, making, together with the £50,969 brought forward from 1916, a total carry forward of £67,990. During the war increasing income-tax had combined with decreasing profits. Companies were assessed on the average of profits for the three preceding years, but they had protected their interests by availing themselves of Section 13 of the Finance Act, 1914, in order to substitute for the three years on which the average is cacluated 1915-1917, instead of 1914-1916, by which we have saved £18,000. While during last year strikes were almost general throughout the Argentine Republic, they were, so far as he knew, the only traction company where satisfactory relations between the company and its employees continued without a break. They had always adopted the policy of paying their men adequate wages, and, what was perhaps quite as important, taking an interest in their individual welfare. The year 1917 had thoroughly tested this policy.

The Chairman gave some interesting particulars of the welfare work among the employees. One branch was the Sanford Home of Rest for consumptive children, which, mainly through the donation of £4,400 from the directors' colleague, Mr. C. H. Sanford, they were able to purchase. It consisted of a large building on the River Plate, with grounds of 12 acres, fields, gardens, and shady trees. It had been such a great success that it was decided to allow the manager to make alterations and additions at the company's expense so that the benefits might be largely extended. Their attitude had created a very favourable impression in official circles and among the public generally. The manager in his report stated there were signs of improvement in business all round, and that they were likely to feel the effect of this improved state of affairs on the traffics, and his opinion in this respect had been justified by the increases in the receipts, which up to date showed £93,538 in excess of the same period of last year. He moved:—"That the report and accounts for 1917, as now presented to the meeting, be received and adopted."

Mr. H. F. Gunning seconded the motion, which was agreed to.

The retiring directors, Mr. J. B. Concanon, Mr. J. Heaton, Baron L. Janssen, and Mr. C. H. Sanford, and the auditors, Messrs. Deloitte Plender Griffiths and Company, and Messrs. James and Edwards, were re-elected. Votes of thanks were accorded to the chairman, directors, the local committee, the general manager, and the staff at home and abroad.

DAMAGES FOR PERSONAL INJURIES.

Appeal in the House of Lords.

It is certainly unusual for a law case on a question of damages for personal injuries by a tramway accident to be appealed to the House of Lords for final decision. An example has, however, been given in the case of Taylor *v.* Dumbarton Burgh and County Tramways Company. The action was brought in the Court of Session, Edinburgh, by Stewart Taylor, as administrator in law for his son James Taylor, 2 years of age. The child was playing on the road in Old Kilpatrick, on January 27, 1916, when a repairing car belonging to the defenders, which had been standing while a pole repair was being executed, was started, and the boy lost two fingers of his right hand. Lord Anderson, as Lord Ordinary, awarded damages of £150 against the tramway company. The Second Division, on appeal, found that the pursuer had failed to establish fault on the part of the company's servants, and reversed the Lord Ordinary's judgment, but it was unanimously restored by the House of Lords on April 26.

The Lord Chancellor, in moving that the appeal should be allowed, said that the repairing car had been at a standstill in order to effect repairs on a standard, and children had gathered round to watch the proceedings. From the evidence it appeared that all the children, with one exception, were on the north side, and when the car was about to start the conductor warned the children there. He did not look on the other side of the car, and the child Taylor there was seen by no one. His hand was run over. As the south side had not been looked to it was not unreasonable for Lord Anderson to come to the conclusion that there was actionable negligence on the part of the defenders' servant. Each case of this kind must be judged on its own circumstances. The only principle of law in this case was that where there were children about the man in charge of the car should look and see if there were children in danger. Even granting that there was contributory negligence in allowing a young child to be in the street without sufficient guardianship, that did not prevent the right to recover if it was found that the whole cause of the accident was want of care on the part of those in charge of the car. In order to bar an action the contributory negligence must be in the transaction itself, and not in an antecedentary cause.

Viscount Haldane, Lord Shaw, and Lord Parmoor concurred. Lord Shaw also criticised the action of the Second Division of the Court of Sessions in not allowing the case to be tried before a jury. Nobody could contend that amendment of the law, however justifiable, or any encroachment upon constitutional right, could be argued pro and contra in a law court or in any other place than the Legislature, with a view to the repeal or modification of the law. The consequences in the present case had been deplorable. Their Lordships had now a case before them which might have been concluded by the simple verdict of a jury, but it had been made the subject of appeal, and they were now trying a case which, for aught yet seen on the merits of it, should never otherwise have been disposed of than conclusively and finally by a verdict of a jury. The expense to both parties was a deplorable incident, and it was one of the consequences of having varied the procedure, which, so far as they had been instructed, had not been justified by any legal element in the case.

Goods Traffic on Scottish Tramways.—Scottish tramway authorities are considering the suggestion of the Road Transport Board that tramway cars should be used for the carrying of goods and parcels. The idea of the Board is that by goods traffic on tramways a saving of horse haulage and petrol can be secured, and tramway authorities have been asked to prepare a return, showing what could be done by day or night.

Digitized by Google

LONDON TRAMWAY ESTIMATES.

At a meeting of the London County Council on July 2, the Highways Committee submitted the revised estimates of revenue and expenditure for the year ending March 31, 1919:—

Total receipts		£3,321,750
Total working expenses*		2,593,140
Surplus on working		£728,610
Interest on bank balances, rents, etc.... ...		23,279
Total working surplus		£751,889
Charges against working surplus:—		
Debt charges, including £430,458 for repayment of capital and £264,747 for interest on capital	£695,205	
Income-tax (less tax deducted and retained from interest paid), expenditure on surplus property, and sundry items	44,569	
		739,774
Estimated net surplus (to be transferred to the renewals fund)		£12,115

* Including war service allowances and £50,000 provision for contingencies.

The revised estimates are based on the assumption that the car-mileage during the year will be 50,000,000. This estimate of mileage depends on (i.) maintenance of the necessary supply of power; (ii.) the necessary repairs to cars being effected; and (iii.) the necessary number of operatives being available.

How Coal Economy has been Effected.

With regard to (i.) the committee remark that tramway undertakings have been called upon to reduce their consumption of coal by at least 15 per cent. The possibility of economy in coal has for a long time past engaged the committee's closest attention, and methods adopted for coal economy at the power-station, including the partial substitution of coke locally produced, have secured compliance with the immediate Government requirements without reducing the tramway services, which are at present limited to the public needs. As a further means of economising coal, the Highways Committee propose to grant a bonus to motormen and conductors for power saved in operating their cars. With regard to the supply of materials for repairs, great difficulties and delay have been experienced, but owing to the responsibilities of the Tramways (Board of Trade) Committee towards tramways essential to the prosecution of the war, a better basis has been established for obtaining materials, and it is hoped that there will be less difficulty in future. The committee is advised that the immediate prospects with regard to staff requirenemts are far from satisfactory, owing to the operation of the Military Service Acts, and the maintenance of an adequate staff is a very serious problem.

The fare revision was applied south of the Thames as from May 18, and certain changes took effect on the lines north of the Thames on June 8, but owing to arrangements with other undertakings concerned in through running services, a complete fare revision was not effected until June 24. The general manager anticipates that the increased revenue from the proposed fare changes might be expected to meet the deficiency balance of £205,290, which was anticipated if the old fares had been maintained, and the cost of urgent renewals (£125,000) during the year. The revised estimates show that not more than £12,115 will be available out of revenue for the year for the renewals fund.

Question of Further Fare Revision.

The committee view with anxiety the constant and rapid growth of operating expenses, and the prospect of such a small appropriation out of revenue toward the cost of renewals, and they have given careful consideration to the question whether further steps should not be taken immediately by again increasing fares to improve the revenue. They consider that the effects of the recent fare revision must be carefully observed over a longer period to enable an opinion to be formed as to the prospects for the remainder of the year.

It is estimated that the passenger receipts will average 15·62d. per car-mile on the estimated mileage of 50,000,000. The revised estimated receipts for 1917-18 were 13·82d. (Actual receipts for 1916-17, 12·01d., 1913-14, 8·94d.) Working expenses, excluding the special charges and war service allowances, are estimated at 11·2d. per car-mile. (Actual expenses for 1916-17, 8·22d.; 1913-14, 6·47d.) The great growth in working expenses is due mainly to advances in war wages and the increase in the price of materials. The estimates contain a provision of £204,000 for the payment of allowances to officers and employees on war service. In 1917-18 the amount provided for this purpose was £114,300.

The total rates payable in 1918-19 are estimated at £109,940. The renewals fund at March 31, 1918, stood at £279,787. The cost of renewals of special track work, rails, tees, etc., during the current year is estimated at £125,000. The balance in the fund at March 31, 1919, on the basis of the estimates now submitted, is £102,592. The balance of the general reserve fund, calculating investments at cost price, is estimated to amount to £47,817 on March 31, 1919. It is estimated that the net debt, which on March 31, 1914, stood at £9,923,528, will be reduced by March 31, 1919, to about £8,390,000.

London Traffic Control.

In the course of a discussion on fares Mr. A. H. Scott, vice-chairman of the Tramway Committee, said that the object of recent fare revisions was to simplify the system. Under present circumstances it was almost impossible for the Highways Committee to put forward any intelligent system for the coming year; although they had budgetted for 50,000,000 car-miles they did not know whether Government would allow them to be run.

Mr. Hume said that he would welcome any inquiry by the Finance Committee into prospective capital expenditure. The whole facts would be laid before the Council shortly in a comprehensive report.

Mr. Hume said he was sure that at the proper time the Council would be able to speak with a united voice on the question of traffic control. It was a big question as between omnibuses and tramways, and the whole situation would have to be considered. He would not be surprised if before long proposals might come forward which he hoped the Council would consider very seriously. The time was ripe for the solution of the problem.

GLASGOW CORPORATION TRAMWAYS.

In the financial year ended May 31, 1918, the Glasgow tramways have again broken all records. As will be seen from the comparative abstract appended, the surplus to be handed to the common good, which is the sum remaining after the payment of all charges and reserves, and may be regarded as the net profit, amounted to £177,552, as compared with £160,984 in the previous year. This notable result has been obtained in spite of increases in all items of expenditure, amounting to £206,118. The traffic receipts show the very large expansion of £158,603.

Year ended May 31.	1918.	1917.	1916.	1915.	1914.
Traffic receipts	£1,404,110	£1,245,507	£1,149,264	£1,070,694	£1,078,691
Sundry receipts	8,525	14,607	8,072	6,183	5,156
Total revenue	1,414,635	1,260,114	1,157,336	1,076,877	1,083,847
Traffic expenses	527,152	395,736	350,186	345,625	332,546
General expenses	156,949	137,816	144,297	142,020	134,034
Maintenance and repairs ...	179,811	143,758	133,659	144,530	156,214
Power expenses	86,019	67,231	64,346	51,995	53,483
Clydebank bridges	1,132	879	516	—	—
	951,063	745,420	693,004	684,170	676,277
European War	93,120	92,645	80,438	51,817	—
Total Expenditure ..	1,044,183	838,065	773,442	735,987	676,277
To net revenue account ...	368,452	422,049	383,894	340,890	407,570
Dumbarton tramways ...	—	—	—	126	180
Interests on investments ...	8,580	78,637	81,203	65,701	64,809
Total	377,032	500,686	465,097	406,717	472,559
Deductions—					
Rent of Paisley lines ...	11,119	8,453	6,700	5,559	5,830
Interest on capital ...	—	78,846	90,474	78,797	82,921
Sinking fund	—	114,378	109,614	105,493	102,607
Income-tax	64,405	64,622	39,853	22,789	14,057
Parliamentary expenses ...	61	98	500	8,818	609
Renewal and depreciation	123,894	73,305	174,408	172,310	212,642
Total	199,479	339,702	421,549	393,766	418,626
Surplus to common good ...	177,552	160,984	43,548	12,951	53,893

The following are the traffic statistics:—

	Total.	Increase.
Track mileage single open...	196¼	—
Car-mileage	26,261,231	475,184
Traffic receipts	£1,404,110 4s. 8d.	£158,602 5s. 6d.
Traffic receipts per car-mile	12·832d.	1·240d.
Traffic receipts per passenger	·782d.	·013d.
Passengers carried	430,946,566	42,651,690
Passengers per car-mile ...	16·409	1·350

The following statement gives the number of passengers at each fare:—

	Year to May 31, 1918.	Year to May 31, 1917.
½d. Fare	272,902,138	247,971,348
1d. ,, ...	110,608,645	100,118,754
1½d. ,, ...	28,462,112	24,970,118
2d. ,, ...	9,332,956	7,839,444
2½d. ,, ...	4,351,666	3,540,215
3d. ,, ...	2,215,506	1,720,316
3½d. ,, ...	2,696,504	1,879,053
4d. ,, ...	377,039	255,628
	430,946,566	388,294,876

From July 1, 1894, to May 31, 1918, the totals are as follow:—Passengers carried, 5,236,560,507; miles run, 413,053,528; car traffic revenue, £18,710,101 16s. 2d.

Digitized by Google

FINANCIAL REPORTS AND MEETINGS.

Norwich Electric Tramways Company.—A dividend of 6 per cent. has been paid for the year ended June 30, 1917.

Canadian General Electric Company.—A dividend has been declared of 2 per cent. on the common stock for the three months to June 30.

Brazilian Traction, Light and Power Company.—A quarterly dividend of 1½ per cent. on the cumulative preference shares was paid on July 1.

Manila Electric Railroad and Lighting Corporation.—A dividend of 1½ per cent. ($1·50) per share has been declared for the quarter ended June 30.

Coventry Chain Company.—An interim dividend of 6 per cent. per annum (7½d. per share) has been declared on the ordinary shares for the half-year ended June 30. The dividend last year was at the same rate.

Edgar Allen and Company, Limited, after paying the preference dividend and allocating £20,000 to general reserve, pay 10 per cent. and a bonus of 1s. 6d. per share, making a total of 17½ per cent. on the ordinary shares, free of tax, and carry forward £35,340.

Yorkshire (West Riding) Electric Tramways Company.—The directors have decided to pay an interim dividend of 3 per cent. (being at the rate of 6 per cent. per annum) on the 6 per cent. cumulative preference shares for the half-year ended June 30, 1918.

J. G. White and Company.—The report for the year ended February 28, 1918, states that net profit was £13,362; £41,679 was brought in, making £55,041. The directors recommend a dividend of 6 per cent., less tax, on ordinary shares for the year, and to carry forward £43,041.

Doulton and Company, Limited.—After providing for debenture interest, and including £43,552 brought forward, the accounts show a credit balance of £68,703; out of which has been paid the preference share dividend for the year ended December 31, 1916, absorbing £17,500, leaving £51,203 to be carried forward.

Plymouth Corporation Tramways.—The accounts for the year ended March 31 last show a gross profit of £33,230. After payment of capital charges and income-tax on profit there will be a net profit of £12,338, of which £4,300 will be transferred to the borough fund for the relief of the rates, and £8,038 placed to the reserve fund.

British Insulated and Helsby Cables.—An extraordinary meeting was held at Liverpool, when resolutions were confirmed for capitalising the undivided profits, in order that they might be distributed among the ordinary shareholders, and for increasing the capital to £1,500,000 by the creation of 500,000 ordinary shares of £1 each.

Lancaster Corporation Tramways.—For the year ended March 31 last, there was a profit of £29. This is the first time in the history of the undertaking that all the charges have been met out of revenue. During the year the tramway debt has been reduced by £1,250. The profit on the omnibuses after paying all charges was £572.

New General Traction Company.—The revenue for the year ended March 31 amounted to £18,575. General expenses amounted to £1,191, and debenture interest, less tax, to £5,708, leaving a profit of £11,040. Including £8,070 brought forward, there is a disposable sum of £19,110. A dividend of 4 per cent., less tax, is recommended, carrying forward £8,630.

Colombo Electric Tramways and Lighting Company.—After providing for debenture interest and including the amount brought forward, the available balance is £35,239, a decrease of £1,650. A dividend of 10 per cent., free of tax, has been declared, and £18,500 has been carried to the general reserve and renewal fund, leaving £8,655 to be carried forward.

Prospective Estimated Loss at Belfast.—At the June meeting of the Belfast Corporation it was stated that there will be an ultimate deficiency of £56,500 in the current year's working of the tramways. In view of the position, a recommendation was made by the Tramways Committee to increase the fares to the maximum of one penny per mile for ordinary passengers, and a halfpenny for workmen.

Yorkshire (Woollen District) Tramways.—The report for 1917 states that revenue amounted to £84,585, against £76,140 for 1916. After deducting all expenses chargeable to revenue, including repairs and maintenance, payments to local authorities under agreements, debenture and other interest, and setting aside £10,600 to renewals fund, there remains £19,258; £3,487 was brought forward, making £22,745. The directors recommend a dividend at the rate of 6 per cent. per annum on ordinary shares, to place to reserve fund £5,614, and to carry forward £5,129.

Colchester Corporation Tramways.—Mr. R. C. Bullough, tramways manager, in his report for the year ended March 31, 1918, states that the total revenue was £17,870, an increase of £1,936, and the highest earnings in the history of the undertaking. The gross profit amounted to £4,909, which was sufficient to pay interest on capital, £1,788; allowances to the dependants of men on service, £162; and repayment of loan, £2,789; leaving a net profit of £35 10s. There was an increase of £670 in traffic expenses and £572 in general repairs and maintenance, due to higher wages and extra cost of material.

Birmingham Traffic Increase.—Alderman A. G. Ellaway, in submitting the tramway accounts to the City Council, said that the committee proposed to contribute £25,000 toward the rates. There had been an enormous traffic growth, both by tramways and omnibuses. For the first time the receipts exceeded a million pounds, and since the beginning of this year they had carried four million passengers every week. The weekly receipts averaged over £20,000. The expenditure had increased to even a greater extent. It was estimated that they were carrying the entire population of the city four and a half times per week, and the total was growing, despite the recent increase in fares.

General Electric Company.—This company made notable progress during the year ended March 31 last. The net profits have increased from £265,210 to £348,860. Of that sum £100,000 is placed to reserve, bringing that fund to £500,000, as compared with £400,000 a year ago. The board propose to capitalise part of the reserve fund, utilising £300,000 for this purpose, and to allot five new ordinary shares of £1 each for every £10 share now held. The existing £10 ordinary shares are to be converted to £1 shares. It is intended shortly to raise £1,000,000 further capital by an issue of ordinary and preference shares, for which Treasury sanction has been obtained. The ordinary dividend is again 10 per cent., free of tax. The sum to be carried forward is £145,286, subject to excess profits duty, if any. An agreement has been entered into for the purchase of the works of Fraser and Chalmers, Limited, at Erith.

Rangoon Electric Tramways and Supply Company.—Presiding at the meeting on June 28, Sir F. W. R. Fryer said that after providing for debenture interest, dividend on preference capital and several allocations mentioned in the report, there was a balance of £9,568. The directors recommended the payment of a dividend on the ordinary shares of 3 per cent., free of income-tax, carrying forward £4,258, an increase of nearly £1,300 as compared with last year. Power house expenses amounted to £61,543, as compared with £35,030, due largely to the higher price of coal. The receipts showed an improvement of £4,500, the passengers being nearly 50 per cent. more. The introduction of lower fares had made tramway travelling much more popular. The motor omnibus service, owing to temporary difficulties, had been suspended, and the vehicles had been converted to other use.

Bombay Electric Supply.—The report for 1917 states that the total revenue, including sale of current to tramways, was £439,850, increase £66,383. Expenditure was £183,457; increase £26,769; net receipts £256,393, increase £39,614. Deduct interest on debenrure debt £33,822, depreciation £43,333, capital amortisation £16,340, balance of English excess profits tax for year 1915, assessed and paid in 1917, £2,634, provision for English excess profits tax for three months ended March 31, 1916, assessed by the London assessors, £10,000, Indian super-tax £3,475, and annual contribution to provident fund £3,537, aggregate £113,141. Balance of profit £143,251, plus £5,215 brought in, making £148,466. The directors recommend, free from all income-tax, to holders domiciled in India, a dividend for the year on ordinary shares at 10 per cent., and bonus at 4 per cent. per annum, and bonus of one month's pay to officers and employees, carrying forward £6,768.

Brush Electrical Engineering Company.—Mr. Emile Garcke, chairman, presiding at the annual meeting, said that the year had been one of considerable activity in all departments. Notwithstanding the difficulties of manufacture, owing to the shortage of labour and material, the output, measured in money value, constituted a record. There was an increasing demand for their standard products for war service, but on the rolling stock side their regular business had been practically at a standstill, all their resources in the woodworking shops having been devoted to another product in which they had been particularly successful. The demands for their Ljungstrom turbo-generator sets and accessories had increased so rapidly that a large extension of the machine tool equipment had to be arranged. The present high taxation of profits did not favour the increase of capital which would be so much required after the war. Mr. B. S. Broadhurst, managing director, seconded the motion for the adoption of the report, and a dividend at the rate of 6 per cent. per annum on ordinary stock for years 1916 and 1917 was confirmed.

Swansea Improvements and Tramways Company.—The report for the year ended December 31, 1917, shows that the revenue for the year amounted to £79,753, an increase of £7,411. Of the available balance a sum of £3,000 will be placed to reserve; preference dividends absorb £2,598, and a dividend at the rate of 6 per cent. is recommended on the ordinary shares. An interim dividend at the rate of 5 per cent. was paid for the first half-year in October last. The ordinary dividend requires £7,800, and the balance of £2,654 is being carried forward. Mr. C. G. Tegetmeier, presiding at the annual meeting, said that the business had been carried on under considerable difficulties. Scarcity of labour and materials had imposed a heavy strain on the management, which at the same time had to face increased demands for travelling facilities. This increase in traffic had, however, enabled them to meet the increased charges, and to maintain the dividend of 6 per cent. on ordinary shares which they had paid for some years past. The total revenue was £7,411 more than for the preceding year. The running expenses

Digitized by Google

amounted to £28,752, an increase of £2,668, owing to the increased wages. The progressive movement in wages was still going on. In addition to the increase of £1 a week over pre-war wages, a fresh demand was being made for an increase of 12½ per cent. on the wages now paid. To meet this increase the ordinary fares had been slightly raised, but they were under a statutory obligation to carry workpeople at all hours of the day at a fare of a halfpenny per mile. Mr. David James, the general manager, deserved their warmest thanks.

Potteries Electric Traction.—The report for 1917 states that revenue amounted to £176,745. Traffic and parcel receipts were £160,060; increase £24,941. Expenses increased by £24,972, although many repairs and practically all renewals had to be deferred. Deducting all expenses, including debenture interest and £10,000 for renewals, there remains £34,444, as compared with £33,152; £7,261 was brought forward, making £41,705. The directors recommend a dividend on ordinary shares at the rate of 3½ per cent. per annum, to place to reserve account £12,500, and to carry forward £8,380. The reserve now amounts to £57,932, and renewals fund to £55,738. The tramway and omnibus services have been carried on with great difficulty. The period has now expired in which the Corporation of Stoke-on-Trent were entitled to give notice to purchase the tramways and light railways within the borough, and their right to purchase does not arise again until 1924 and 1932 respectively.

Leeds City Tramways.—At a meeting of the Tramways Committee, Alderman R. A. Smithson presiding, the report and analysis of the operating expenditure and income for the year ended March 31, presented by Mr. J. B. Hamilton (general manager), were approved. The receipts amounted to £586,631, an increase of £70,824 over the previous year. The earnings per car-mile averaged 14·746d., as compared with 12·817d. for 1916-17. The working expenses amounted to £314,042, or 7·894d. per car-mile, an increase of £53,157. This was attributed mainly to increase in wages amounting to, approximately, £43,000, coupled with advances in the prices of materials used. The annual cost of war bonuses paid to employees amounted to £90,000. Traffic expenses exceeded the previous year's figures by £28,037, of which £16,021 represented the increase in wages paid to motormen and conductors. Another increase of £3,543 under the heading of "ticket check" was owing very largely to the big rise in the price of paper. The fuel bill had increased approximately £1,200. Against the gross profit of £272,588 (£254,920 the previous year) there were the following charges:—Interest on capital, less bank interest, £37,174 (£40,021); redemption fund, £64,899 (£62,222); income-tax, £23,257 (£17,846); war service allowances, £12,053 (£12,890); general renewals, £59,694 (£30,000); and other lesser sums, leaving a net surplus of £214,588 (£175,489). Out of this the amount appropriated in relief of rates was £58,000, as against £79,431 in the previous year.

Nottingham Corporation Tramways.—The following is a summary of the results for the year ended March 31, 1918, and for the three preceding years:—

Year ended March 31.	1918.	1917.	1916.	1915.
	£	£	£	£
Total revenue	238,867	203,155	195,392	179,315
Working expenses	155,484	138,717	121,266	112,583
Profit on working	83,383	64,438	74,126	66,732
Interest	16,639	16,495	16,452	13,833
Sinking fund	8,459	8,459	8,459	8,442
Repayment of loans	15,715	15,715	15,714	15,290
Nottingham Corporation Bill ...	—	—	—	502
Net profit	42,570	23,769	33,501	28,665
Contributions to rates	16,000	10,000	20,350	22,500
Reserve fund	26,570	13,769	13,151	6,165
Passengers	52,690,881	47,480,934	35,741,208	41,210,964
Fare per passenger	1·07d.	1·02d.	1·01d.	1·02d.
Car-mileage	3,776,275	3,766,411	3,885,322	3,789,857
Units per car-mile	1·79	1·70	1·64	1·53
Power cost per car-mile	2·62d.	2·39d.	2·25d.	1·91d.
Receipts per car-mile	15·18d.	12·94d.	12·06d.	11·35d.
Expenses per car-mile	9·88d.	8·44d.	7·49d.	7·13d.
Ratio of expenses	65·09	68·28	62·10	62·78
Total track mileage	44·25	44·25	44·25	44·25
Number of cars in stock	155	155	155	155

COLLECTION OF USED TICKETS.

The Paper Controller has announced that a trial is to be made on certain routes of the London County Council Tramways with collecting boxes for used tickets, and that if this is found to be satisfactory the collection will be extended as soon as boxes or bags can be obtained. Provided that adequate information is given to passengers as to the necessity for the step, there should be no question as to the experiment proving successful. For years before the war several hundred pounds were realised annually at Glasgow by the sale of used tickets.

PERSONAL.

Mr. John Moxon, chairman of Newport (Mon.) Tramways and Electricity Committee, has been awarded an O.B.E.

Mr. W. E. Owen has resigned his position as superintendent of the power-station of Northampton Corporation Tramways.

Lieut.-Col. W. A. Vignoles, borough electrical engineer of Grimsby Corporation, has recently been awarded a bar to his D.S.O.

Mr. Lachlan Mackinnon, traffic manager, has been appointed deputy general manager of Glasgow Corporation Tramways.

Mr. H. H. Gordon, having joined the forces, has resigned his seat on the Highways Committee of the London County Council.

Mr. F. W. Mackinney, chief officer of stores of the London County Council, has been granted an increase in salary from £1,000 to £1,250.

Alderman T. Baker has been elected chairman of the Plymouth Tramways Committee in succession to the late Alderman S. H. Phillips.

Mr. J. W. Dugdale-Bradley, city engineer and surveyor of Westminster, has been granted an increase in salary from £1,200 to £1,300 a year.

Mr. O. F. Francis, electrical engineer and tramways manager of Kirkcaldy Corporation, has been granted an increase in salary from £400 to £450 per annum.

Regimental Sergeant-Major J. R. Jones, Royal Welsh Fusiliers, formerly a motorman on the West Ham Corporation Tramways, has been awarded a D.C.M.

Mr. A. F. Lucas, manager of Leicester Corporation Tramways, has been recommended by the Tramways Committee for an increase in salary from £500 to £600.

Mr. J. Bowen, city engineer and surveyor, has been appointed borough engineer and surveyor of Wimbledon, in succession to Mr. C. H. Cooper, who has resigned.

Mr. O. C. Power, traffic manager of the Birmingham and Midland Motor Omnibus Company, has been elected a member of the general committee of the Commercial Motor Users' Association.

Mr. J. B. Feltham, electrical engineer to Mexborough Urban Council, has been appointed honorary district engineer to the Coal Controller in connection with the fuel rationing scheme.

Mr. E. George Mawbey, borough surveyor of Leicester, who was responsible for the construction of the Corporation Tramways, has been granted an increase in salary from £1,250 to £1,400 a year.

Mr. R. G. Elliott, station superintendent of Hull City Tramways, has been appointed honorary district engineer and representative of the technical adviser to the Controller of Coal Mines, Board of Trade (Coal Mines Department).

Mr. J. W. Hame, city electrical engineer and tramways manager of York, has been appointed district engineer to assist the technical local representative of the Controller of Coal Mines in securing coal economy in local engineering and other works.

Mr. W. J. Shave, chief engineer of the London General Omnibus Company, and **Mr. J. G. Clark,** of the Gas Light and Coke Company, have been appointed members of the sub-committee which is investigating the use of gas for traction purposes.

Lieutenant L. C. F. Bellamy, R.E., who resigned the position of manager of Ilkeston Corporation Tramways in September, 1914, to join the forces, has been awarded the Military Cross. He was also mentioned in Sir Douglas Haig's despatch of April 7. Mr. Bellamy is a son of the late Mr. C. R. Bellamy, general manager of the Liverpool Corporation Tramways.

Mr. W. T. Robson.—The Southampton Tramways Committee have adopted the following resolution:—"The committee, having heard with extreme regret that the general manager and engineer, Mr. W. T. Robson, has not apparently benefitted in health by his recent vacation, desire to place on record their high appreciation of Mr. Robson's devotion to duty while he has been in the service of the Corporation. Further, the committee recommend Mr. Robson to take an extended holiday, with the sincere hope that he may soon return fully restored to his usual health and able to resume his duties.

Alderman Ellaway has been appointed chairman of the Birmingham Tramways Committee. He was an original member of the committee, and has served continuously since his appointment. For ten years he was chairman of the Electric Supply Committee. The Lord Mayor, Alderman Sir David Brooks, alluded to the valuable services rendered to the department by Mr. Harrison Barrow, who recently resigned his membership of the City Council, and on the motion of Alderman Ellaway, a resolution was approved expressing the committee's regret at the circumstances which had led to the resignation by Mr. Barrow of the chairmanship of the Tramways Committee, a position which he had held for ten years, and high appreciation of his valuable services.

Mr. Fred Coutts, who was one of the six candidates for the general managership of the Edinburgh Corporation Tramways placed on a short list selected by the committee for further consideration, has sent a letter to the Town Clerk of Edinburgh withdrawing his candidature, in which he explains that his directors, who have

Digitized by Google

treated him in a most liberal way since he entered their service, have asked him in the national interests to remain. As the output of shipbuilding and munitions in the district is, to a large extent, dependent on the tramway service, he feels it would ill become him to refuse a request to remain and give all the help in his power to keep up the full supply of munition workers' cars. He adds that for some years he had looked forward to the probable honour of some day managing the Edinburgh tramways, but in these days one must sink his own personal outlook to his country's needs.

Lieut. T. F. Goldsmith, M.C., of the Manchester Regiment, has recently been awarded a bar to the Military Cross for gallantry and devotion to duty in action. He was formerly engaged as an assistant in the general management office of the Wallasey Corporation Tramways, and has been on active service since the commencement of the war. He joined the 3rd Liverpool Pals Regiment on their formation, and was early promoted to the rank of corporal. After doing good service in the field, he was wounded in action, and invalided home about twelve months ago. On becoming convalescent he was granted a commission in the Manchester Regiment, and while serving in this corps the two honours of the M.C. and bar have been conferred on him. During the recent battles he was unfortunately badly "gassed," but is now making satisfactory progress towards recovery, and expects to be in the front line again within a short period.

Mr. Ernest Hatton, general manager and engineer of Newcastle Corporation Tramways, has been awarded an increase in salary from £1,000 to £1,500 per annum, the increase to be made at the rate of £100 a year during the next five years. At the Council meeting on July 3, Mr. R. Mayne, chairman of the Tramways Committee, in moving the acceptance of the Tramways Committee's recommendation, spoke in high praise of Mr. Hatton's work, and gave statistics showing how greatly the traffic and receipts of the undertaking has increased under his management. Mr. Hatton had proved his worth in a practical way. Not only was he their general manager and engineer, but he had brought out and patented several inventions of which they had the advantage. The recommendation was seconded by Mr. A. M. Sutherland, vice-chairman of the committee. Mr. Sheriff S. Easten, advocating the adoption of the report, stated that he thought the manager and his staff deserved to be congratulated on the service that was maintained.

The late **Mr. Robert W. Blackwell,** of Elm Bank, Hampstead, formerly of Great Smith Street, Westminster, chairman of R. W. Blackwell and Company, Limited, and of Johnson and Phillips, Limited, left £91,388 gross—£90,890 net personality.

CONTRACTS AND ORDERS.

Hadfields, Limited, of Sheffield, are supplying steel points and crossings to Salford Tramways Committee.

The Stirling Boiler Company, Limited, are supplying a boiler and superheater to Hammersmith Electricity Committee at £4,660, plus £500 for fittings.

Ilford Tramways Committee have authorised the tramways manager, Mr. L. E. Harvey, to use the Sandberg process for hardening rails at fifty joints, at £2 per joint.

Salford Electricity Committee have accepted the following tenders:—British Westinghouse Company, Limited, e.h.t. switchgear; E. Green and Son, Limited, fuel economisers; Callender's Cable and Construction Company, Limited, e.h.t. cable and telephone cable.

Glasgow Tramways Committee have accepted tenders for armature coils from the British Westinghouse Company, Limited; for trolley wire from F. Smith and Company; for 500 tons of rails from Bolckow, Vaughan and Company; and for 200 tons of rails from Walter Scott, Limited.

The Brush Electrical Engineering Company, Limited, have an order from the Ipswich Corporation Electricity Committee for a 3,000-K.W. Brush-Ljungstrom turbo-alternator with condensing plant at £19,150. The committee has authority to purchase other plant and machinery required for carrying out the complete scheme.

ROAD TRANSPORT ORDER.

A Road Transport Order dated June 4, made by the Board of Trade under the Defence of the Realm Regulations, provides for returns as set out in the schedule to the Order of all vehicles and horses which are used for the transport of goods by road, except those used wholly or mainly in agriculture, or horse-drawn vehicles having a load capacity of less than 15 cwt. The returns are required by July 31.

LACK OF FUEL FOR EASTBOURNE OMNIBUSES.—Dissatisfaction has been caused by the reduction of the Corporation omnibus service at Eastbourne, owing to the lack of motor spirit. The Corporation were recently advised to utilise several chassis of older vehicles for the collection of dust, etc. According to Mr. Ellison, the manager, the chassis were not in running order, but could have been made so if he had been able to retain the skilled men.

TRAMWAY AND LIGHT RAILWAY NOTES.

BIRMINGHAM.

THE QUESTION OF WOMEN DRIVERS.

The question of employing women as car drivers has been considered, but in view of the heavy traffic on the steep gradients the proposal is not regarded with favour. For some months many discharged soldiers have been employed, and it is hoped that with the assistance given by voluntary drivers, of whom there are nearly three hundred, it may be possible to avoid the employment of women.

BOURNEMOUTH.

WAR BONUS TO MANAGERS—FEWER STOPPING PLACES.

The Town Council have approved the recommendation of the Tramways Committee that a bonus of 1 per cent. on the net profits for the year be granted to the general manager and the assistant manager, in the proportion of four-fifths to the general manager and one-fifth to the assistant manager. This bonus is to be regarded as in respect of the work of the year covered by the report. With a view to economy in current, 25 per cent. of the stopping places on the tramways have been cancelled. The committee have received petitions from Poole against the restricted service on Sundays, but they have decided that it is impracticable to re-establish the services, which have been suspended in Bournemouth without complaint. The Mayor, however, has stated that the discontinuance will entail a loss of £4,000 a year.

DUBLIN.

THE PRINTING OF TRAMWAY TICKETS.

In reply to a communication from the Typographical Society, Mr. W. M. Murphy, chairman of the United Tramways Company, has stated that for years a Dublin firm has supplied the company with all the tickets that it has been able to turn out. The firm was not, however, able to supply the company with much more than half of their requirements, which now exceed 66 millions of tickets annually, and for the balance the company has had to go elsewhere, as there is no other printing machinery in Dublin suitable for turning out tickets on a large scale.

EDINBURGH.

COST OF THE TRAMWAY REPORTS—OPPOSITION TO THE QUEENSFERRY SCHEME.

The Tramways Committee have reported that the accounts rendered by Mr. J. B. Hamilton, of Leeds, and Mr. J. S. Brodie, of Liverpool, who reported on the whole question of the tramway system of the city, amounted to £1,304. Mr. Harrison, convener of the committee, said that the reports were of very great importance, and he believed would settle the kind of traction to be used when the Corporation came to remodel the tramways. A large number of petitions have been lodged against the application of the Corporation for a provisional order to construct tramways to Queensferry. The motor omnibus companies present similar petitions, agreeing that there is no necessity for the scheme, as ample means of communication exist. They advance the view that the tramway would injure the city by ruining one of its finest approaches. The route from Edinburgh to Queensferry, they urge, constitutes one of the principal objects of interest to tourists and holiday-makers, and by impairing this feature the tramway would strike at the very traffic it is designing to cater for. The Edinburgh *Evening News* remarks that such solicitude on the part of the people who have flooded Princes Street and the finest approaches to the city with gas-bags, elevated on the top of ungainly omnibuses, is not convincing. There will be a local inquiry into the application for the Provisional Order.

GLASGOW.

ACCIDENT TO A 16-YEAR-OLD DRIVER—200 MOTORMEN AFFECTED BY THE NEW MILITARY SERVICE ACT.

Lord Anderson, in the Court of Session on June 21, disposed of two cases arising out of an accident at Victoria Road on December 5, when a car left the rails, dashed on to the pavement, and was overturned. The driver was 16 years of age. One passenger claimed £750 damages from the Corporation in respect of injuries received in the accident. The Corporation admitted liability and tendered £125 with expenses, claiming that the sum sued for was excessive. The court held that the pursuer's health had been seriously impaired, and awarded £500 with expenses. Another passenger, who sued for £500, was awarded £200 with expenses. The labour question is becoming increasingly serious. About 200 additional drivers are affected by the latest military order, and the tramways department has appealed for more women workers. Unless a sufficient number of women offer themselves for training, it will be necessary to curtail the service. Meanwhile, the traffic continues to increase.

LEICESTER.

CONDUCTORS' DUTY WHEN STOPS ARE REDUCED.

The number of stopping-places on the Leicester tramways has been largely reduced, and from June 30 Sunday services do not begin until 10 a.m. "We must accept any slight inconvenience involved by the reduction of the tramway service uncomplainingly,"

Digitized by Google

says a local writer, " but it behoves conductors to be more than ever watchful that they do not overlook intending passengers at points where the cars pull up."

LIVERPOOL.

EVASION OF FARES.

Liverpool Tramways Committee have caused to be posted in the tramway cars special notices conveying a warning that persons who are detected alighting from the cars without having paid the fares will be prosecuted.

LONDON.

TRAMWAYS IN MUNITION AREAS AND GOVERNMENT GRANTS—EXPENDITURE ON ADVERTISING—SUNDAY MORNING SERVICES—ECONOMY BONUS.

Adverting to the statement made in Parliament by the Financial Secretary of the Ministry of Munitions, that the Government would consider any application made by tramways undertakings in munition areas for a subsidy for munition traffic, Mr. G. H. Hume, chairman of the Highways Committee, in reply to a question by Mr. Gilbert, M.P., said that no grants had been made by the Ministry in respect of the Council's tramways. To meet traffic demands the committee had spent £21,000 on the Woolwich sub-station and doubled the lines in the district at the cost of £6,000. The Highways Committee were considering the matter, which it should be added, arose out of the subsidy paid to the London General Omnibus Company, to which reference is made in our motor traffic section. Replying to another question put to him, Mr. Hume said that the Council had agreed to spend £6,250 per annum in displayed advertisements of the tramway services, and that the general manager attached great importance to continuing the publicity.

Ilford Council Tramways Committee have discontinued the service on Sunday mornings, the chairman stating that such a step is necessary in order to comply with the Board of Trade's requirements for economy in coal consumption. On several other undertakings in the Metropolitan area there has been a reduction in the Sunday car facilities. The London County Council and the Metropolitan Electric Tramways Committee withdrew the through running cars on Sunday mornings, but in response to numerous complaints it has been restored to 10 a.m. The County Council have offered a bonus to motormen and conductors for the saving of energy consumed by the cars. Particulars are given on another page of this issue of the conditions under which the bonus will be paid.

MANCHESTER.

FREE RIDES FOR WOUNDED SOLDIERS.

The Lord Mayor of Manchester, alluding to the question of wounded soldiers being given facilities for free riding on the Manchester tramway cars, recently stated that no wounded soldier need walk from the hospital to the city. All that he had to do was to ask the matron for one of the discs supplied by the Tramways Committee.

NOTTINGHAM.

REDUCTION IN STOPPING PLACES.

Councillor R. H. Swain, chairman of the Tramways Committee, announced at the June meeting of the Council that they had decided to abolish or alter 62 of the 1,221 stopping places, in order to economise in energy consumption. This had been done in response to a request by the Board of Trade, and the alterations had been drawn up by the general manager, Mr. J. Aldworth.

PLYMOUTH.

WOMEN INSPECTORS.

Plymouth Tramways Committee have advertised for women inspectors. The demand for men for the forces has much depleted the staff, and a number of cars have had to be withdrawn from the service. At Leeds, women iuspectors have been employed for some time, several of them having been promoted from conductors.

SHEFFIELD.

REVISION OF STOPPING PLACES—NO FARE CHANGES—AUXILIARY MOTORMEN.

The Tramways Committee have reported in favour of reducing the request stopping places from 558 to 484. Sheffield is said to be running the highest number of cars compared with the total number of any large undertaking in the United Kingdom. It has not been necessary to discuss the question of increased fares at Sheffield. The subject has not even been brought to the notice of either the Tramways Committee or the Council, and there is at present no intention to deal with the matter. The fare charged at all times is one penny from the centre of the city to each suburban terminus within the city boundary. The traffic returns are showing an increase of 467,000 passengers weekly over the corresponding period last year. Ald. Fenton, deputy chairman of the Tramways Committee, has informed the Council that the employment of women as drivers was not anticipated, but it was a matter of anxiety whether they would be able to continue the service efficiently if the depletion of motormen went on. The committee were asking for auxiliary drivers, men to give twelve hours a week to assist in driving the cars. He added that Alderman G. Addy was already doing work in that direction.

PATENT LIST.

Abstracted for "The Tramway and Railway World" from the Official Journal of Patents.

*** If the inventions have been communicated the names of the communicators are given in italics.

APPLICATIONS FOR LETTERS PATENT.

Self-propelled vehicles (8,816)—J. D. Abbott.
Self-propelled vehicles (8,818)—T. D. Abbott.
Trolley heads of overhead electric vehicles (8,703)—C. W. Collins.
Speed indicating or distance registering apparatus for use on motor vehicles (9,031)—L. E. Cowey.
Means for adjusting and attaching actuating cables of brakes for motor vehicles (8,723)—Electric and Ordnance Accessories Company and G. H. Rodway.
Steering motor cars, etc. (8,974)—A. Fenwick.
Radiators for cooling power plant on motor cars, etc. (8,987)—E. C. Gilbody.
Variable speed gears (8,762)—J. M. Gloppe.
Rail joints (8,836)—H. T. Goddin.
Material for pads for concrete sleepers, etc. (8,802)—J. C. Grant.
Gas supply mechanism for motor cars, etc. (8,728)—F. W. Hall.
Variable speed gear (8,714)—J. Nelson.
Lever driving device for vehicles (8,869)—R. Pitblado.
Variable speed gear (8,791)—G. Taylor.
Steering control mechanism for power-driven vehicles (8,950)—J. R. Webb.
Life-guards for fronts of motor omnibuses, etc. (8,880)—W. J. Wicks.
Apparatus for indicating and recording direction and distance of travel of a vehicle (9,299)—A. E. Brewerton.
Steam engines for use on motor vehicles (9,102)—T. Clarkson.
Solid rubber tires (9,350)—Dunlop Rubber Company and C. Macbeth.
Bodies for omnibuses, etc. (9,474)—S. Gage, W. E. John, and London General Omnibus Company.
Bodies of automobiles (9,220)—E. Larson and P. S. Larson.
Tipping bodies for vehicles (9,090)—G. E. Lloyd.
Change-speed gear (9,290)—C. C. A. Roche.
Variable speed gear (9,460)—G. Taylor.
Automobile tires (9,229)—W. I. Varner.
Motor vehicles (9,100)—J. Weller and S. B. Weller.
Devices for lubricating motors of motor vehicles, etc. (9,703)—C. E. Baggs and S. J. Thompson.
Street cars (9,809)—A. L. W. Begg.
Jacks or lifting devices for wheeled vehicles (9,878)—L. E. L. Calvert.
Pumps for charging self-oiling tramway wheels (9,504)—D. J. Davies.
Manufacture of wheels of motor vehicles, etc. (9,554)—E. F. Goodyear.
Motor vehicles (9,669)—W. F. Parker and Sir A. J. Compton-Thornhill.
Elevated railways and tramways (9,498)—S. A. Rogers.
Variable speed gear (9,527)—J. M. Ross.
Prevention of skidding by rubber-tired and self-propelled vehicle wheels (9,537)—W. S. Stone.
Detachable wheels for motor vehicles (9,670)—Sir A. J. Compton-Thornhill.
Means for automatically controlling internal combustion engines of motor cars (9,477 and 9,549)—J. R. Walker.
Electric motor control systems (10,120)—British Thomson-Houston Company (*General Electric Company*).
Systems of electric power transmission (10,256)—British Thomson-Houston Company (*General Electric Company*).
Brake blocks and bands, clutch linings, etc. (10,083)—H. Frood.
Mechanism for motor vehicles (9,931)—H. J. Grafham.
Non-skidding devices for wheel tires (10,297)—T. H. Longmore.
Electric traction (9,965)—H. M. E. Mathé.
Transmission and springing of motor vehicles (10,368)—A.B.C. Motors, Limited, and G. E. Bradshaw.
Rear axle clutch gear for motor vehicles (10,710)—F. W. Evans and I. Stephens.
Chassis construction for motor vehicles (10,614)—C. M. Foster.
Device for placing trollies on tramway overhead wires (10,650)—W. H. Gamble.
Electric generator for motor vehicles (10,548)—J. Gambs.
Bonnets of motor car engines (10,356)—R. Lamb.
Appliance for use on tramway cars, etc., for checking delivery of tickets to passengers (10,508)—F. L. Maclaren.
Electric railway systems (10,687)—E. J. Patelski.

SPECIFICATIONS PUBLISHED.

1917.

Power transmission (6,265—*115,267*)—Leyland Motors, Limited, and J. G. P. Thomas.
Driving mechanism for motor tractors (6,411—*115,277*)—Alldays and Onions Pneumatic Engineering Company, N. L. Hilton, and C. E. Simms.
Steering gear for motor vehicles (7,825—*115,309*)—A. Stewart and D. S. Stewart.

Digitized by Google

STEAM AND HYDRAULIC
ENGINE PACKING
MANUFACTURERS
(Flax, Asbestos and Cotton)
And all Engine Room Stores
ATTWATER & SONS
Hopwood Street Mills, PRESTON
Telegraphic Address: "Attwaters, Preston."

STEAM CONDENSING PLANT.
VACUUM PUMPS AND EVAPORATORS.
MIRRLEES WATSON
THE MIRRLEES WATSON CO. LTD., GLASGOW

"TRIPLEX"
THE UNSPLINTERABLE
Safety Glass, for every purpose:
Aircraft, Automobiles, Ships,
Railway Carriages, Trams & Buses,
Shopwindows, Show Cases,
Spectacles &c, &c,
CONTRACTORS TO H.M. GOVT
THE "Triplex" Safety Glass Co., LTD.,
(Reginald Delpech, Managing Director)
1, Albemarle Street, Piccadilly, London, W.1

METRIC WEIGHTS & MEASURES AND BRITISH EQUIVALENTS
COMPILED BY
A. J. LAWSON, M.Inst.C.E.
ON BEHALF OF
The BRITISH-ITALIAN COMMERCIAL ASSOCIATION
(Incorporated)
5 VICTORIA STREET, LONDON S.W.1
Conversion Tables of practically every British unit of measurement into Metric Equivalents are given with great detail and accuracy. These, in conjunction with the tables of £ s. d. and *lire*, will enable merchants and manufacturers to quote in the measurements and currency of the country with which they wish to trade.
Cloth, blocked in gold Size 8½ by 6½ 212 pages 5s. nett
EYRE AND SPOTTISWOODE LTD., EAST HARDING STREET, LONDON

Electric Tramcar Handbook
FOR
MOTORMEN, INSPECTORS, AND DEPOT WORKERS.
By W. A. AGNEW.
120 Pages, 7 in. by 4½ in. Cloth. Price 1s. 6d. Postage 2d.
Copies can be obtained from THE TRAMWAY AND RAILWAY WORLD Offices, Amberley House, Norfolk Street, W.C.2

Chassis construction for motor vehicles (8,121—*115,315*)—J. Cox.
Mechanical starting gear for internal combustion engines used for motor cars (9,021—*115,326*)—G. H. Parkin.
Protective devices for use in systems of electric distribution (9,953—*115,334*)—British Thomson-Houston Company (*General Electric Company*).
Variable speed gear (10,976—*115,345*)—H. C. Ford.
Controlling the current in connection with electro-magnetic gear boxes of automobiles (5,009—*115,458*)—Wolseley Motors, Limited, and T. Wardell.
Radius lever for braking or facilitating the starting of vehicles (6,505—*115,474*)—T. Stanier.
Clutch and transmission mechanism for motor road vehicles (6,575—*115,484*)—Birmingham and Midland Counties Transport Company and G. E. D. Ralls.
Anti-skid chain placing and removing mechanism for motor vehicles (8,462—*115,524*)—E. A. Ryan.
Lifting jacks (9,079—*115,531*)—W. Robins.
Brake adjusters for vehicles (18,646—*115,598*)—A. E. W. Maseyk.
Couplings or connections for electric cables, particularly intended for use on railway vehicles (6,870—*115,680*)—J. Stone and Company (*M. Walton*).
Method of installing and disposition of electrical equipment for motor road vehicles (6,889—*115,682*)—T. L. R. d'Orville.
Apparatus for use in regulating the carburetters of motor-driven vehicles (6,900—*115,684*)—H. F. C. Whitehead.
Motor road vehicles (7,336—*106,618*)—R. Booth.
Dynamo electric apparatus for motor vehicles (8,622—*115,722*)—H. Lucas, C. L. Breeden, and H. E. Moore.
Combined driving and steering device for motor vehicles (15,410—*115,765*)—H. G. C. Fairweather (*A. Leffler*).
Engine suspension devices in motor cars (7,264—*115,883*)—G. Roesch and C. Talbot, Limited.
Devices for the lighting and heating of vehicles (7,562—*106,826*)—Maschinenfabrik Oerlikon.
Differential devices for the road wheels of a motor-propelled vehicle (10,563—*115,962*)—S. J. Murphy.
Universal drive for motor vehicles wheels (16,430—*116,029*)—O. H. Rogers.
Buffers for motor vehicles (17,864—*112,770*)—Stewart-Warner Speedometer Corporation.
Construction and arrangement of motor vehicles (19,317—*116,046*)—M. C. I. Hunter.
Power transmission gearing for motor vehicles (4,646—*116,112*)—A. F. Kuefer and R. B. Wilson.
Safety devices for automobiles (7,819—*106,831*)—H. Weinberg and C. Weinberg.
Trailers for commercial motor road vehicles (8,026—*116,152*)—J. Banks.
Vehicle lifting jacks (10,937—*116,186*)—T. A. Jenner and F. R. Goddard.
Steering mechanism of motor-propelled vehicles (11,815—*116,192*)—Alldays and Onions Pneumatic Engineering Company, C. E. Simms, and N. L. Hilton.

1918.

Operating mechanism for variable speed and torque gearing (2,871—*115,397*)—Leyland Motors, Limited, and J. G. P. Thomas.
Electric couplings (5,230—*114,429*)—H. de la Valette.
Mounting of internal combustion engines on motor vehicles (3,559—*115,795*)—R. E. Green.
Turning and stopping indicators or signals for road vehicles (5,231—*114,430*)—J. L. Ames.

ADDRESSES OF AREA TRANSPORT OFFICERS.

The Ministry of Munitions have issued a form containing the addresses of the Area Transport Officers, and notifying to contractors that in many cases the officers will be able to arrange for the conveyance of the material at a less cost than is possible under private arrangements. It is further stated that in many cases they can arrange to save special journeys being made by the contractor's vehicle with possibly an empty journey home. Appended are the addresses of the Area Transport Officers :—

Scotland (Glasgow), 39, Elmbank Crescent ; 'phone, Central 9880.
Newcastle-on-Tyne, Pearl Buildings, Northumberland Street ; 'phone, Newcastle Central 3814.
Middlesbrough, Royal Exchange Buildings ; 'phone, Middlesbrough 466.
Liverpool Pearl Buildings, St. John's Lane ; 'phone, Liverpool Bank 5174.
Manchester, 70, Spring Gardens ; 'phone, City 8450.
Leeds, Quebec Chambers, Quebec Street ; 'phone, Central 5500.
Sheffield, Foster's Buildings ; 'phone, Sheffield 1698.
Bradford, Royal Hotel, Room 14 ; 'phone, Bradford 3866, Ext. 8.
Birmingham, 111, New Street ; 'phone, Midland 2700.
Coventry, 44, Bayley Lane ; 'phone, Coventry 1361.
Cardiff, Principality Buildings, Queen Street ; 'phone Cardiff 5252.
Bristol, 3, Unity Street, College Green ; 'phone, Bristol 5090.

Digitized by Google

TRAFFIC RETURNS.

Tramway and Omnibus Undertakings in the United Kingdom.

NAME OF COMPANY OR CORPORATION.	1917. WEEKS ENDED.					1918. WEEKS ENDED.					AGGREGATE.		
	June 2.	June 9.	June 16.	June 23.	June 30.	June 1.	June 8.	June 15.	June 22.	June 29.	Wks.	1918.	Increase or Decrease.
	£	£	£	£	£	£	£	£	£	£		£	£
Aberdare U.D. Council	557	453	405	415	394	523	569	461	443	473	12	6.235	—
Aberdeen Corporation	2.435	1.821	2.197	2.228	2.229	3.396	2.187	2.603	2,434	2.480	4	9.704	+ 1.229
Ayr Corporation	370	421	472	471	524	519	611	538	603	610	6	3.687	+ 818
Belfast City	6.239	6.318	6.591	6,448	6,429	7,732	8.160	7.151	7.031	6.874	13	98.283	+ 19.845
Birkenhead Corporation	1.929	1.884	1.946	1.859	1.903	2.251	2.163	2.112	2.053	2.259	13	27.547	+ 4.749
Blackburn Corporation	1.336	1.403	1.575	1.522	1.364	2.954	1.981	1.914	1.608	1.630	13½	24.106	+ 4,714
Bradford Corporation	10.048	7.321	8.271	7.647	7.817	8 483	9.894	9.769	9,168	9.699	13	109.937	+ 12.375
Burnley Corporation...	2.299	1.789	1.845	1.745	1.796	2.235	2.197	2.105	2.188	2.200	—	—	—
Burton-on-Trent Corporation ...	320	293	296	289	298	400	391	392	400	399	13	5.164	+ 1.494
Bury Corporation	2.059	2.057	1.691	1.554	1.698	2.619	2.029	1.953	1.939	2.069	13	26.202	+ 4.677
Chatham and District	1.770	1.584	1.540	1.500	1.396	1.321	1.484	1.351	1.330	1.349	26	31.374	− 246
Cork Electric	623	585	655	663	634	736	784	666	653	700	26	15.660	+ 2,551
Derby Corporation	1.414	1.191	1.222	1.183	1.168	1.535	1.515	1.508	1.461	1.465	13	19.260	+ 4.297
Dundee City	1.530	1.512	1.559	1.572	1.530	1.939	1.999	1.965	1.859	1.860	6	11.590	+ 2.455
East Ham Corporation	1.630	1.437	1.523	1.404	1.419	1.491	1.535	1.512	1.555	1.511	12½	18.576	+ 232
Glasgow Corporation	27.539	26.923	28.108	27.014	27.448	31.072	31.255	28.941	28.819	29.974	4½	125.817	+ 12.650
Glossop (Urban Elec. Supply Co.)...	199	170	173	163	152	212	194	174	167	178	26	4.740	+ 1.121
Halifax Corporation	3.913	2.471	2.620	2.681	2.455	2.904	2.933	2.612	2,453	2.523	12½	33 544	+ 3.338
Halifax Corp. Motor Omnibuses ...	382	41	23	42	42	507	64	59	55	58	12½	743	+ 213
Huddersfield Corporation	4.834	3.142	3.478	3.233	3.223	3.864	3.834	3.409	3.396	3,242	13	47.813	+ 4.170
Ilford U.D. Council	956	783	773	757	775	998	1.108	993	975	1.023	13	12.784	+ 3,195
Ipswich Corporation	905	711	754	712	702	764	755	736	702	733	13	9.412	+ 1.531
Isle of Thanet	492	354	356	440	386	285	310	301	278	303	39	8.006	+ 2.710
Kilmarnock Corporation	180	181	183	183	183	223	232	214	232	235	6½	1 510	+ 319
Lanarkshire	2.923	3.066	3.144	3.065	2.929	3.710	4.251	3.696	3.659	3,828	26	87,726	+ 20,857
Lancashire United	3.063	3.431	2.559	2.485	2.316	3.912	3.149	2.925	2.842	2.807	26	71.607	+ 18.985
Leeds City	14.354	10.642	11.754	10.998	10.958	12.415	12.300	13.293	13.296	13.807	13	159.215	+ 20.990
Leicester Corporation	4.604	3.623	3.881	3.575	3.665	4.612	4.742	4.542	4,463	4.540	—	—	—
Leyton U.D. Council	2.376	1.959	1.958	1.898	1.816	2.113	2.297	2.217	2.129	2.198	13	27.157	+ 2.524
Liverpool Corporation	16.966	16 065	16.907	16.228	16,122	18.887	19.445	18.116	18.159	18,891	25½	449.394	+ 68.500
Llandudno and Colwyn Bay ...	501	383	372	393	401	481	450	487	497	559	30	9.779	+ 2.533
London County Council	62.596	56.833	58 223	55.472	55.153	63.382	67.068	65.293	64,533	64.866	12½	765.006	+ 84.503
Maidstone Corporation	291	250	244	238	238	254	287	260	248	268	12½	3.527	+ 538
Manchester Corporation	23.553	21.298	22.062	20.933	19.280	27.560	26.581	24.764	25.023	25.025	13	327.585	+ 64.016
Newcastle-on-Tyne Corporation ...	8.579	7.692	8.028	8.086	8.174	9.219	9.429	9.141	9.093	9.239	13	117.144	+ 19.807
New St. Helens and District ...	2.072	1.702	1.548	1.476	1.330	1.935	1.932	1.810	1.670	1.589	52	76.242	+ 17.450
Northampton Corporation	1.048	788	845	822	805	826	835	848	812	801	13	11.263	+ 1.095
Nottingham Corporation	5.592	4.172	4.473	4.386	4.197	5.881	6.081	5.917	5.931	5.857	13	72.898	+ 19.337
Oldham Corporation	3.168	3.396	3.053	2.744	2.895	4.272	3.420	3.364	3,444	3.435	14	48.408	+ 9,242
Reading Corporation	1.198	1.031	1.082	1.088	987	1.302	1.361	1.324	1.253	1.312	12½	16.006	—
Rhondda Tramways	2.280	1.514	1.567	...	...	1.882	1.670	1.735	...	...	24	39,754	+ 6,308
Rotherham Corporation	1.782	1.718	1.759	1.683	1.774	2.111	2.063	2.106	2.316	2.287	13½	28.926	+ 5.521
Sheffield Corporation	12.966	11.753	11.986	11.609	11.861	13.943	13.590	13.655	13.296	13.234	13½	187.056	+ 26.309
Southampton Corporation	2.195	2.008	2.072	2.077	1.976	2.468	2.582	2.476	2.459	2.561	12½	31.082	+ 7.497
Southend-on-Sea Corporation ...	1.422	1.058	1.027	1,003	985	962	1.147	1,089	1.113	1.148	13	12.049	+ 748
South Shields	...	...	...	946	1,172	...	...	...	1.098	1.399	13	14.683	+ 2.877
Sunderland Corporation	2.133	1.785	1.908	1.802	1.914	2.089	2.031	2.001	2.010	2.148	13	27.190	+ 4.321
Swindon Corporation	327	273	289	286	258	280	285	269	279	302	12½	3.680	+ 395
Torquay Tramways	781	...	...	...	...	917	...	...	...	...	—	—	—
Tyneside Tramways and Tramroads	1.404	870	1.002	1.034	...	1.119	1.273	1.165	1.042	...	24	23,511	+ 5.643
Wallasey Corporation	1.853	1.547	1.708	1.557	1.588	1.934	2.005	1.770	1,740	1.912	12½	23.183	+ 4,180
Walsall Corporation	1.305	875	932	910	911	1.154	1.200	1.170	1.170	1.192	13	15.717	+ 3.671
Walthamstow U.D. Council ...	1,758	1.350	1.331	1.244	1.221	1.552	1.701	1.518	1.456	1.584	13	18.914	+ 2.914
Warrington Corporation	584	533	546	534	...	742	742	705	722	...	12	8.553	+ 2.600
West Ham Corporation	4.323	3.821	3.991	3.680	3.647	4.183	4.528	4.377	4,288	4.287	12½	53.060	+ 5.902
Wigan Corporation	2.457	1.881	1.967	1.927	1.901	2.246	2.236	2.207	1.537	2.172	13	29.263	+ 5.213

*** During the war the issue of traffic returns has been suspended by a number of undertakings.

Colonial and Foreign Tramway Traffic Returns.

NAME OF COMPANY.	1917. WEEKS ENDED.					1918. WEEKS ENDED.					AGGREGATE.		
	June 2.	June 9.	June 16.	June 23.	June 30.	June 1.	June 8.	June 15.	June 22.	June 29.	Wks.	1918.	Increase or Decrease.
	£	£	£	£	£	£	£	£	£	£		£	£
Anglo-Argentine	51.765	54.115	55.314	52.296	49,639	55.495	56.754	48.420	50.966	52.347	26	1,433305	+ 96.246
Calcutta ... ... Rs.	64.567	64.508	66.098	66.331	65.455	70.548	72.232	72.129	74.519	74,413	26	1,862.162	+138.216
Madras ... ... Rs.	33.405	(2 weeks)	32.142	(2 weeks)	...	41.152	(2 weeks)	29.261	(2 weeks)	...	24	443.140	+ 67.216
Pernambuco	3.813	3.881	3.726	4.144	...	4.082	4.409	4,393	4.539	...	25	113,114	+ 22.055

Companies issuing Monthly Statements only.

	1917.						1918.						Wks.	AGGREGATE.	
	Jan.	Feb.	March.	April.	May.	June.	Jan.	Feb.	March.	April.	May.	June.		1918.	+ or −.
	£	£	£	£	£	£	£	£	£	£	£	£		£	£
Ballarat & Bendigo ..	3.521	3.196	3.329	4.538	...	...	3.771	3.902	3.928	4.094	...	...	52	44.572	+ 1.915
Brazilian Traction Mlrs	7266000	6872000	7549000	7453000	7864000	...	7837000	7315000	8094000	8330000	9030000	...	21	40606000	+3,602.000
Brisbane	33.020	29.800	33.340	31.620	33.340	32,475	34.500	32.009	35,530	35,530	37.610	36,245	26	211.424	+ 17.829
British Columbia $	493.315	451.679	456.626	447.429	438.919	...	559.569	501,150	510.892	515.417	486.876	...	48	5.497.564	+ 544,211
Buenos Ayres Lacroze	38.142	35.977	41.337	39,111	40.595	38,020	38.902	34.398	42.647	41.643	41.315	38,375	52	467,758	+ 3.680
Burma	23.802	22.912	27.132	23.660	24.906	...	25.429	22,985	27,906	27.614	29,019	...	43	268.775	+ 9,058
Cape Town	18.440	...	17,688	16.705	...	...	19.707	...	19.911	19.011	...	...	—	—	—
Carthagena & Herrerias	3.982	3,223	2.955	4.366	4.321	5.325	4.011	4.031	5.316	4,200	5.027	5,047	26	27.632	+ 3,460
Cordoba	12.432	11.896	...	...	...	...	12.845	12.972	...	...	...	...	47	147.938	+ 435
East India	1.836	1.570	1.647	1.445	1.455	1.186	1.176	1.318	1.729	1.791	1.920	1.754	48	15.961	− 4,365
Kalgoorlie	2.431	2,193	...	...	...	...	2.522	2.373	...	...	...	...	8	4.895	+ 271
La Plata	4.315	4.092	4.528	4.230	4.127	...	4.711	4,745	5.347	5.169	5.105	...	21	25.078	+ 3.786
Lima	36.841	34.228	37.586	37,834	...	...	43.536	41.913	42.106	43,557	...	...	17	171.112	+ 24.623
Manaos ... ... Rs.	146.493	144,532	161.156	...	...	...	151.871	133.591	157.337	...	...	...	13	442.799	+ 3.819
Manila ... ... $	...	...	67.140	65.600	...	...	...	...	9.700	84.000	...	...	17	274.000	+ 68.060
Monte Video	33.341	32.304	31.979	29.230	28.716	...	36.016	34.573	36.659	33.704	32.301	...	26	238.338	+ 23 000
Peruvian ... ... $	935.130	844.770	1017000	957.500	902.780	965,420	1189350	925,410	1119530	1079880	1022120	1099470	52	12.524.030	+1,395,938
Port Elizabeth	4.498	...	4.428	3.904	...	...	4.779	...	4.425	4.028	...	...	—	—	—
Rangoon	4.633	4,605	6.226	5.036	4.737	...	5.361	5.662	5.955	5.885	5.719	...	21	28.582	+ 3,345
Toronto ... ... $	1002469	932.567	991.192	970.367	992.460	...	1068319	981.933	1113472	1065766	1090747	...	21	5.320.237	+ 431.182
Winnipeg ... $	319.945	280.717	293.094	265.594	259,794	...	334.642	298,899	307,289	296,433	280,935	...	21	1.518,198	+ 99,054

Digitized by Google

EFFICIENCY

in a motor vehicle is limited to the efficiency of

The Engine

No matter how perfect the other components may be the efficiency of the Vehicle as a whole is singly vested

Daimler

The Daimler Co. Ltd.

Coventry

THE DAIMLER SLEEVE-VALVE ENGINE produces power in abundance. It will maintain a continuity of service which is unapproached by any other engine. The sliding sleeve-valves have eliminated the troublesome springs and tappets, giving a permanent valve setting which is mathematically correct and unvarying for every cylinder.

The absence of any pockets and projecting parts in the combustion chamber avoids all pre-ignition risks, and gives a very high fuel efficiency. The engine is, as a whole, considerably simpler, neater in exterior appearance and lighter than the ordinary type, and ALL WORKING PARTS ARE ENCLOSED AND THOROUGHLY LUBRICATED.

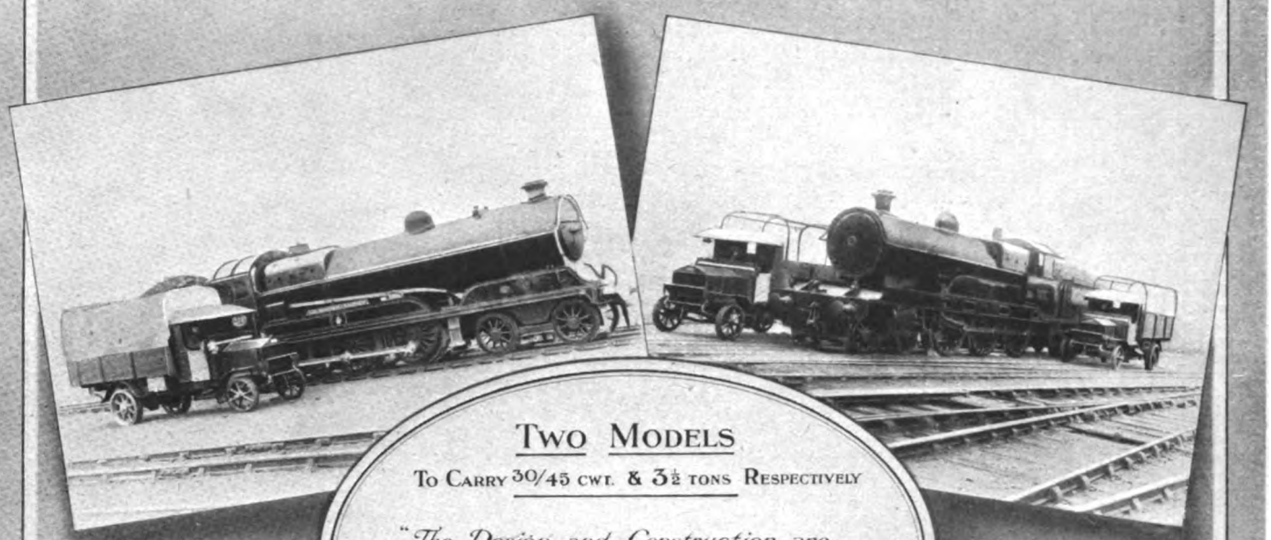
If you have once driven a Daimler you will appreciate its qualities; if not, write for the book "Actual Experience." Sent post free.

10

Digitized by Google

NAPIER

MOTOR VEHICLES.



TWO MODELS

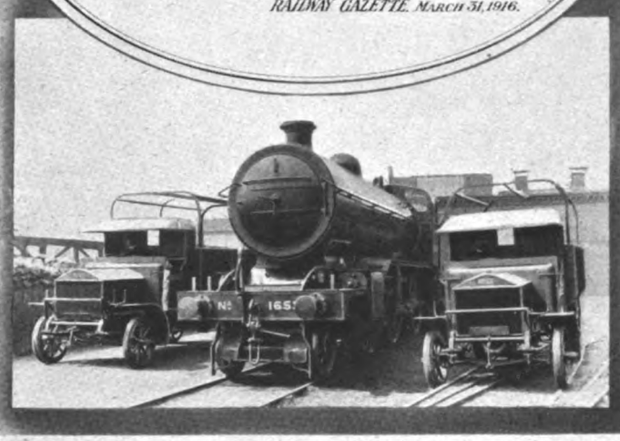
To Carry 30/45 cwt. & 3½ tons Respectively

"The Design and Construction are Throughout of a Character, which it would be Exceedingly Difficult, if not Impossible, to Improve Upon."

RAILWAY GAZETTE, March 31, 1916.

IN PEACE

USED BY THE LARGEST CARRYING COMPANIES AND COMMERCIAL HOUSES.



IN WAR

USED BY THE BRITISH AND ALLIED GOVERNMENTS.

D·NAPIER & SON LTD

WORKS
ACTON, LONDON. W

14, NEW BURLINGTON ST. LONDON. W.

Digitized by Google

There are some very interesting points in the report of the Electrical Vehicle Committee for the past year. Of these, the chief is perhaps the statement of the policy of the Committee in its advocacy of the electric vehicle as compared with other forms of traffic. There has always been a tendency in some quarters to put forward the electric as a direct competitor of the petrol vehicle, and one writer has recently gone so far as to suggest that no petrol vehicles should be permitted to be built above one ton. This kind of thing is no doubt intended to help along the movement in favour of the electric vehicle, but its effect is generally bad, inasmuch as it stirs up the active antagonism of other interests which conceive that they are being unfairly attacked. Consequently it is gratifying to note that the Electric Vehicle Committee does not suggest that the electric vehicle can compete with the petrol vehicle in long distance work, where high speed and unfettered radius of action can be fully utilised. The electric is defined as "essentially a moderate speed machine with a definite limit to its radius of action and a particular characteristic which makes good road surfaces desirable for its satisfactory operation." This is a very fair definition, from which it follows, as the committee points out, that the real competitor of the electric is the horsed vehicle, because the special sphere of both is what is generally termed short distance, frequent stop delivery work in urban and suburban areas. Of course, one cannot pretend that this sort of thing involves no competition with the petrol vehicle. We cannot set up a definite limit between short distance and long distance work. The work of the motor vehicles shows infinite variety from the shortest to the longest, and somewhere along the scale there must be a point or stage at which the short distance and the long distance vehicle are about equally attractive. There is always room to argue as to where this point lies. The advocates of the electric will naturally put it higher up than the advocates of the petrol vehicle, so that, at a certain point, competition must necessarily exist. What we deprecate, however, is the idea of competition all along the scale. There are certain cases in which the petrol vehicle is the only possible thing. There are others in which it would be foolish to employ a petrol vehicle if an electric were available. The steam vehicle, whether of the ordinary lorry or tractor type, or of one of the types burning special fuels, also has its fields of application, which may overlap to some extent the fields of the other two classes. While it is our duty to consider the advantages and disadvantages of each method for any particular case under consideration, before committing ourselves to a decision, we can safely condemn broad claims that any particular method is necessarily the best under all conditions. The Electric Vehicle Committee wisely and clearly condemns the statements of indiscriminating enthusiasts that the electric vehicle is destined in the near future to supplant entirely the petrol and steam types for all classes of work, and adds that there is nothing to give support to this view. But at the same time the committee points out that, in the particular sphere where its advantages are most valuable, there is ample room for immense developments in the production and use of electric vehicles, sufficient to keep everybody concerned thoroughly busy for many years to come, without worrying ever to contest doubtful cases which lie upon the border line.

* * * * * *

Recognising that the above is an honest indication of the actual state of affairs, we feel that it is possible to support the view of the committee that, when normal conditions return, there will be a big demand for electric vehicles, and that this fact should be recognised by people who have hitherto regarded the petrol vehicle as possessing something of a monopoly. Undoubtedly the electric delivery van will become a common object in every considerable town, and it would be a pity if the bulk of the business to be done in these vehicles were left to foreign manufacturers. We recognise the basic principles that British motor manufacturers would not be well advised to split up their output by manufacturing large numbers of models; but we hope that somehow or other, without abandoning this principle, British manufacturers will look to the possibility of producing electric vehicles. Such vehicles are particularly likely to be assembled jobs, at any rate to some extent. The chassis, the electric machines, and the battery must be three totally distinct classes of manufacture. Even the chassis may be assembled from components, so that the work of producing the necessary electric vehicles would apparently fall very naturally to those firms who will, after the war, have at their disposal large shops suitable for assembly work and facilities for quantity manufacture of some definite class. Thus the assembling of a complete electric vehicle in quantity might be combined with the manufacture of a standardised electric motor. No manufacturer of petrol vehicles

Digitized by Google

MOTOR TRAFFIC.

need consider it beneath his dignity, if it happens to be convenient, to provide in his own works for the manufacture of a large additional number of bare chassis with the power plant and to become an assembler of electric vehicles to the extent of purchasing the motors and the batteries from specialists, each manufacturing in quantity also. The result should be a thoroughly sound vehicle at a moderate price and national independence of foreign importers.

Some time has passed since the Departmental Committee appointed by the Board of Trade to consider the position of the engineering trades after the war, took evidence from the motor and other industries. The report of that committee has now been published and is a decidedly valuable compilation. The great majority of its recommendations are very sound, and the same applies to its criticisms of the internal organisation of the engineering industry as a whole. In one important respect the conclusions reached strike us as being rather half-hearted. The committee has not had the courage to press home the opinion of the majority of its members, to the effect that a tariff is absolutely necessary, particularly to ensure the future of the lighter sections of the engineering trades. It is hardly safe to conclude that tariffs will come automatically because they will be necessary for revenue purposes. This may or may not be the case, but it seems to us desirable that, if tariffs are a necessity to any industry or industries, those charged with studying such industries should say so without any equivocation. The needs of essential industries will carry more weight with public opinion than any other argument which could be brought to bear upon a question which was at one time unfortunately a matter of acute disagreement between political parties. Probably it will always be conceivably possible to raise the necessary revenue without tariffs. The question of whether the tariff method is to be adopted will probably depend upon whether it is clear that the great industries demand it as being essential to their existence. Consequently, we do not think that the committee should have shirked a plain statement, even if it had to be a majority recommendation and not a unanimous one. We need not be influenced by any idea that our present Allies would think it unfriendly to us to introduce tariffs. In view of their own past action, this would be absolutely unreasonable. On the other hand, unless we are mistaken, they fully expect us to protect our own markets as they have always done. In the case of the motor industry, such protection appears to be rendered at least temporarily necessary by the fact that our friends in America, who are our biggest competitors in this matter, have in their protected home market a much wider sphere of action than is available to the British industry. Without large markets we cannot have quantity output on the most economic lines, and this is what we must have if our industry is to flourish and progress.

* * * * * *

Subject to the reservations suggested by the notes given above, the advice of the Engineering Trades Committee as regards internal organisation appears to be very sound. We must certainly abandon the wasteful process of producing a multiplicity of models from one factory and must concentrate on one or two models, turned out in considerable numbers. If, by means of co-operation, we could not only manufacture but could sell in very large quantity, then selling costs would be reduced to a minimum. Co-operation carried to this extent is, however, very difficult of achievement. It would seem that we must get rid of our rather strong prejudice against assembled articles. We have always been somewhat inclined to look down upon these as not possessing the uniformly good quality of the product of a single manufacturer. If, however, we cannot co-operate to the extent of amalgamation, we shall probably do best by recognising the existence of specialists, each one of whom produces one well-made component in a few standard models and in large numbers. Given a certain degree of collaboration between the makers of such components, there seems to be no reason why a motor vehicle assembled from their various products should be appreciably inferior to one that is wholly built in a single factory. In small ways it may fall short of the ideal, but this should be fully balanced by its lower cost. The recognition of the principle of assembly would result in something very much like the amalgamation of a number of specialised firms for the purpose of building a single article which would be erected in and sold by a central establishment.

SAVING IN TRANSPORT COSTS.

From a report issued by the Metropolitan Asylums Board it appears that during the past year 5,100 tons of goods have been transported by motor vehicles at a cost of £748, including depreciation and establishment charges. It is estimated that at pre-war rates for horse transport the cost would have been £1,336.

Reporting to Finsbury Borough Council on the working of a Lacre motor sweeper for the 26 weeks ended December 15, 1917, the cleansing superintendent states that the cost of carrying out the same work with horse brooms would have been £383 10s., as against £263 2s. by motor sweeper, showing a net saving of £120 8s. The motor sweeper is travelling 45 miles per night. The comparison is made with war conditions, but, strictly speaking, it should be made with pre-war conditions, when seven horse brooms were at work, as against five now in use. Assuming that only the work of four horse brooms was done, although Mr. Crookes thinks reasonable claim might be made to have displaced five, the result of the six months' working would be as follows :—

	£	s.	d.
Working costs of three horse brooms ...	383	10	11
Plus additional horse broom displaced one-third	127	16	11
	£511	7	10
Motor working cost	263	2	3
Net saving for six months ...	£248	5	7

During the winter falls of snow the sweeper did useful work, the value of which it is difficult to estimate.

TRANSPORT INQUIRY ASKED FOR.

The House of Commons agenda paper contains a notice of a motion for the appointment of a Select Committee to inquire into the methods, working, and equipment of the various agencies by which the system of internal transport and the delivery of goods is carried on, to examine such suggestions as may seem worthy of consideration, to appoint outsiders to serve on any sub-committees it may deem desirable to set up, and to report to the House of Commons from time to time. This subject has been considered more than once by the Commercial Committee—a large and important inter-party body—and should the committee decide to support an appeal for a day for the discussion of the motion the Government would be compelled to give facilities. The motion, however, is hardly likely to get further than the notice paper unless it receives the support of such a body, for instance, as the unofficial Commercial Committee of the House.

Digitized by Google

MOTOR TRAFFIC.

OMNIBUS SELECTION BY TESTS.

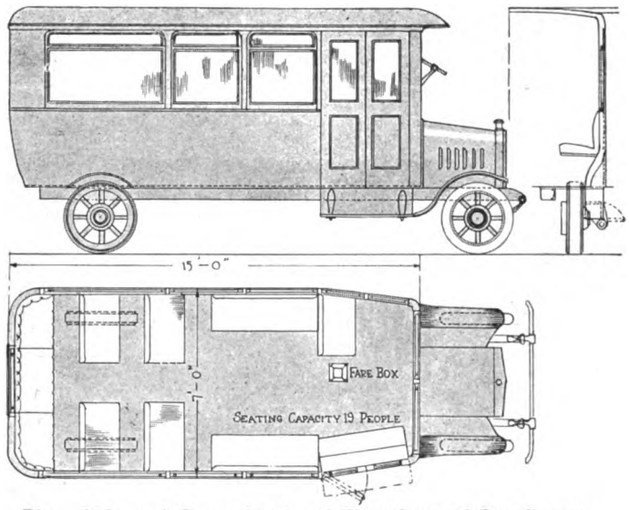
SPECIFICATION OF 19-30 PASSENGER TYPE SUPPLIED TO SAN FRANCISCO COUNCIL.

The White Company, Cleveland, Ohio, have executed a contract for the supply to the San Francisco Municipal Railway Department of five single-deck motor omnibuses for operation through the Golden Park district. The new service will connect the tramway termini on the south and north sides of the park in response to the demand of the residents for additional facilities. The department have also agreed to the request of the State Harbour Commissioners to run a service along the Embarcadero, operating between Fishermen's Wharf on the north end and the channel on the south, a distance of three miles along the water front.

The service through the park is in accordance with the policy advocated by the city engineer of utilising omnibuses for extending the tramway service from the existing termini in order to develop the outlying districts. In his report the engineer laid stress upon the point that any omnibus route once established must be maintained until the traffic becomes heavy enough to warrant tramway extension.

Upon this page will be seen the plan, side and cross section elevations of a type of vehicle which is to form the fleet of five machines. It was selected after a series of competitive tests, and the specifications upon which the tenders were based were as appended :—

Power.—The omnibus with a 4,000-lb. load must be able to ascend a 5 per cent. grade on high gear ; on next to high gear a 10 per cent. grade ; and on low gear or reverse an 18 per cent. grade. On the latter grade it must be able to start from a stop.



Plan, Side and Cross-Sectional Elevations of Omnibuses
Selected by San Francisco Tramways Department.

Speed.—Under the same condition of loading an omnibus must be capable of continuously maintaining a schedule speed of 12 miles per hour, including stops, without exceeding at any time a speed of 20 miles per hour on the 100-mile test run over the test course.

Fuel Consumption.—The contractor was required to state in his proposal the minimum fuel consumption in gallons per mile for both gasoline and distillate, that he will guarantee for each omnibus. This was determined on the test run. In case of failure to meet this guarantee, 100 dollars was to be deducted from the contract price of the omnibus for each 5 per cent. by which the fuel consumption exceeds the guarantee.

Motor.—Four-cylinder, vertical type, to operate silently and without appreciable vibration, all working parts to be completely enclosed and protected from dust and dirt. Thorough lubrication to be provided, including a direct-acting oil circulation system to all bearings not adequately supplied by splash from the crank case. Oil indicator to be installed on the dash. Sealed governor to be provided, by means of which the maximum speed may be limited to any predetermined value between 15 and 25 miles per hour.

Cooling.—Pump-driven, circulating-water system, so designed as to permit thermo-syphon circulation in case of pump failure.

Carburetter.—Automatic in operation, and economical with either gasoline or distillate ; of a type requiring minimum adjustment and attention.

Ignition.—High-tension magneto and auxiliary coil for use with the starting and lighting battery—Bosch system or equal.

Starting and Lighting System.—Complete with separate unit generator and motor, storage battery, starting pedal, lighting switches and ammeter. Storage battery to consist of standard make lead or Edison cells, mounted in acid-proof tray. Extreme service conditions to be met by this battery may require burning all lights for six consecutive hours, and starting the engine at least four times an hour, following a period of operation of three hours, during which the omnibus will operate without lights, but with the same conditions as to starting. During this action or cycle of operation it should not be necessary to charge the batteries from an external source.

Transmission and Axles.—Three speeds forward and one reverse ; to be of best design and materials. Construction of the driven axle to be such that no power-transmitting member supports any part of the weight of the frame or load.

Tires.—Either pneumatic or solid. The contractor to name in his proposal the type, size, and make of tires which he recommends and which he proposes to furnish, and also to name sum which he will permit to be deducted from the price of the omnibus in case the city chooses to furnish at its own expense tires different from the contractor's choice.

Brakes.—Two sets to be provided, either of which alone shall stop the loaded omnibus when descending a 15 per cent. grade with engine disconnected, travelling eight miles per hour.

Control.—Steering wheel to be on the left side ; levers, instruments, etc., located accordingly.

Body.—Construction to be permanent and substantial throughout, framed of hardwood, and rigidly attached to chassis frame.

Entrance.—Equipped with double folding door, controlled by lever. The steps to fold up when door is closed, or to be completely enclosed by the door. An emergency door in the rear, controlled from the driver's seat, is also required.

Windows.—Are to be of heavy plate-glass, readily removable or replaceable to suit weather conditions, and provided with pantasote curtains on spring rollers.

Seats.—Spring cushioned and upholstered with Fabrikoid leather, rigidly supported on light metal pedestals. A section of the rear seat must be hinged so as to clear the emergency doorway when opened.

Hand Straps and Grab Handles.—To be provided for the convenience of standing passengers.

Push Buttons and Buzzer.—Provided for signalling to the driver.

Lights.—One 2-candle-power tail lamp ; two 8-in. headlights, equipped with 21-candle-power gas-filled running lamps ; 4-candle-power lamps for dimming, and Osgood deflector lens ; six nickel-finished dome lights, with Holophane bowls and 10-candle-power lamps ; two reflector fixtures with 6-candle-power lamps for sign-box on roof ; one shaded dash light with 2-candle-power lamp ; one step light equipped with shade and 4-candle-power lamp, to be automatically switched on or off by entrance door mechanism.

Ventilators.—To be such as will insure ample circulation of fresh air without draughts when doors and windows are closed.

Trap Doors.—To be installed in floor where necessary to give access to mechanism.

Floor Covering.—Battleship linoleum ⅜ in. in thickness.

Finish.—Entire vehicle to be thoroughly painted, varnished, striped, lettered and numbered. Exterior finish to be Valentine's "VVV" system. Interior woodwork to be stained cherry red and finished as in railway practice.

Accessories.—Complete set of small tools, front fender and buffer, electric alarm, with 8-in. gong, hand-operated Claxon, Warner speedometer, Hunter destination sign, Johnson fare-box, and skid chains for rear wheels.

The vehicle has a seating capacity of 19, with total accommodation, seated and standing, for 30 passengers. It is arranged for operation with a driver only, the entrance and pre-payment fare-box being at the front end. At the rear is an emergency exit. The specification was drawn with the view of enabling tenderers to submit their standard commercial vehicle chassis, and the contract was awarded to the vehicle which, in the judgment of the city engineer, would show the lowest net cost of operation over 125,000 miles, and at the same time meet the general requirements of the specifications. The tests were made over the routes on which the vehicles are to be used, and under such loads as they would be called upon to carry in actual service, viz., 4,000 pounds, inclusive of driver and observers. Each tested omnibus went over the course sufficiently often to make the total run of 100 miles for each test.

During the running the governor was set to limit the speed to a maximum of 20 miles per hour, and a schedule speed of 12 miles an hour, including stops, was required. The schedule speed was determined by dividing the total mileage covered by the total elapsed time. Two such test runs were made, using petrol for one

Digitized by Google

MOTOR TRAFFIC.

and distillate for the other. During each test the omnibus had to make 361 stops, pulling into the kerbstone at each stop, and remaining at rest ten seconds. Additional tests of power and braking were also made to see that the specifications had been complied with.

The contractors were also asked to state the amount which they would allow in case the department desired, after running the vehicle 125,000 miles, to return the chassis without the bodies, the allowance to be applied towards the purchase of a new chassis, or to the payment of any money due to the contractor. No proposal was made by the White Company under either of these suggestions.

REGISTRATION OF TRANSPORT VEHICLES.

As briefly reported in our issue of June 13, the Board of Trade on June 4 issued a Road Transport Order requiring all owners of vehicles used for the transport of goods by road to make a return in respect of such vehicles, in a form set out in a schedule to this Order. Returns, which are to be made by July 31, 1918, must be sent to the Secretary of the Road Transport Committee for the area in which the vehicle is usually kept. Any person wishing to dispose of any vehicle in respect of which a return has been made under this provision must first give notice in writing to the Secretary of the Road Transport Committee for the area in which the vehicle is registered.

On and after September 1, 1918, vehicles may only be used for the transport of goods by road under and in accordance with the terms of a permit granted by the Road Transport Board. The Order does not apply to vehicles used wholly or mainly in agriculture.

Form R.1, to be used for vehicles driven by motor spirit or gas, is as follows :—

In accordance with the provisions of the Road Transport Order, 1918, you are required to fill in the particulars set out below, and to return this form, in the addressed envelope herewith, to the (name and address of secretary of Area Road Transport Committee) not later than July 31st, 1918.

If at any subsequent date the particulars provided by this form are subject to amendment, you are required to notify the alterations immediately.

1. Name and full address of owner.
2. Occupation or trade.
3. Give the following particulars in respect of each vehicle (including trailers):—
[The particulars required in columns 1 to 10 are the registration number of each vehicle the make, the H.P., type of body, load capacity, average monthly mileage, where stationed, and number of motor spirit licence and/or gas permit.]
4. State for each vehicle—(*a*) Class of goods conveyed. (If various classes of goods are conveyed, the percentage for each class should be stated as far as possible.) (*b*) Towns and villages served, with distances covered.
5. How many of these vehicles are not in regular use?
6. Are any of them laid up for any particular reason? If so, give full particulars.
7. For what proportion of your mileage are your vehicles running empty? Have you considered any means of obviating this?
8. To what extent have you been able to co-operate with other owners of vehicles running to the same towns and villages served by your vehicles, with a view to the elimination of duplicate delivery services wherever possible?
9. Give particulars of any of your vehicles which are let out on hire, stating the name and address of the hirer and the length of contract.
10. Give particulars of any other of your vehicles which you are prepared to let for hire—(*a*) with driver, (*b*) without driver.
11. How many drivers are employed by you (*a*) male, (*b*) female?
12. If any of your vehicles are held at the disposal of any Authority for use in the event of a national emergency, give the name of the Authority and particulars of the vehicles.
13. State total monthly number of gallons of motor spirit licensed for purchase for use in the vehicles specified in this return.
14. Any other particulars or remarks.

A Form R.2 is to be used for vehicles driven by steam, including tractors and traction engines. In this the preamble is as in Form R.1. The remainder is as follows :—

1, 2. As in Form R.1.
3. Give the following particulars in respect of each vehicle (including trailers):—Columns 1-6, as in Form R.1. Column 7, tires used (steel or rubber). Column 8, load capacity. Column 9, average monthly mileage. Column 10, stationed at.
4, 5, 6, 7, 8, 9. As in Form R.1.
10. Give particulars of any of your vehicles which you are prepared to let for hire.
11. How many drivers are employed by you?
12. As in Form R.1.
13. Any other particulars or remarks.
Remainder of form as in Form R.1.

Form R.3, for vehicles electrically driven, is as appended :—

1, 2. As in Form R.1.
3. Give the following particulars in respect of each vehicle:—Columns 1-6, as in Form R.1. Column 7, type of accumulator and number of cells. Column 8, load capacity, Column 9, average monthly mileage. Column 10, stationed at.
4, 5, 6, 7, 8, 9, 10, 11, 12.—As in Form R.1.
13. Any other particulars or remarks.
The remainder of the form is as in Form R.1.

Statement in the House of Commons.

Replying to an inquiry by Mr. Alden, M.P., whether the Road Transport Board were about to take over the whole of the road transport of the country, with a view to the better distribution of food, and if he could make any statement as to the methods to be employed, Mr. Wardle, Parliamentary Secretary to the Board of Trade, said that it was not proposed to take over the road transport of the country, but the Road Transport Board has been appointed to take such measures as may be necessary to ensure the most economic use of road transport vehicles and their efficient allocation for meeting such requirements as may arise from time to time for the transport of food, munitions, and other war materials, and for the essential needs of the trade and industry of the country. Powers had been taken under a Defence of the Realm Regulation.

REPAIR SHOPS AND STORES LOST IN FRANCE.

New Base to be Established in Buckinghamshire.

Considerable opposition was expressed in the House of Commons on June 12 to the appropriation by the War Office of land in South Bucks as a lorry repair base. The site has an area of one and a half square miles, of which 600 acres had growing corn and the rest market gardens, mostly under glass. It was contended that there were many other sites available, such as private parks and golf courses, to say nothing of racecourses and commons.

In opposing a motion for the adjournment, Mr. Macpherson, Under-Secretary of State for War, said the land had been taken for the erecting of a workshop and store for spare parts in connection with the mechanical transport. The German offensive had made it absolutely necessary for them to have a great centralised department of this kind as near London and as near the principal manufacturers as possible. The home of mechanical transport in this country was in or near London, and it was necessary that a centralised depot for the supply of spare parts for the repair of innumerable damaged wagons should be within twenty-five miles of London. It was also necessary that that depot should be near the War Office, the Ministry of Munitions, the Air Ministry, and the most prominent manufacturers who dealt with the various departments. It was further necessary that the depot should be near a railway and a canal in order to afford facilities for the shipment of stores to the theatres of war all over the world. The railway afforded facilities, without going through London, for the shipment of stores to all our theatres of war. It was also necessary that the soil should be gravel. At the present moment we could not procure sufficient steel, and consequently it would be necessary to use a very large amount of ferro-concrete. It was much easier, again, to stand a large number of vehicles on gravel soil. It was also necessary that the ground should be level. The War Office would willingly have taken the private parks, the golf course, or the racecourses to which reference had been made if they had satisfied the conditions, but they had not satisfied those conditions in a single case. The only place near London which satisfied those conditions was the ground they had taken. Before coming to a decision the various departments, including the Food Production Committee, were consulted. General Smuts was appointed by the War Cabinet to consider the case, and he came to the conclusion that this was the only suitable site. At no time in the history of the war had there been a greater necessity for the mobility of the army. He was not going to explain what was happening or what might happen in France, but the enormous need of having at our disposal, near at hand, a great accumulation of vehicles and of spare parts, near the great centres of industry, was most important.

Mr. Bonar Law, in an appeal to the House, mentioned that what made the matter more pressing for the moment was that some of the repairing shops in France had been lost owing to the German advance.

The motion for the adjournment was negatived.

AUSTIN MOTORS FOR REFUSE COLLECTION.

On April 1, 1917, Marylebone Borough Council brought into operation a scheme for the collection and disposal of house and street refuse by means of a fleet of ten Austin motor wagons, etc. The motor vehicles cost £7,510, and the total capital outlay on other plant and the acquisition and alteration of buildings was £22,054. The expenditure on the collection of house refuse only for the first year's working was £19,290, including £2,000 in extra wages as war bonus, whilst the lowest tender received from contractors was £26,780. For the current year the outlay is estimated at £17,125, as against an offer of a contractor to do the work for £26,730. The Highways Committee state that if house refuse collection and slopping combined for 1917-18 and 1918-19 had been entrusted to a contractor the cost would be £64,560, as against £42,715 by the Council. On the two years' working they anticipate a saving of £21,845, which will have practically covered the whole of the capital outlay, and the Council will possess valuable realisable assets, without having imposed any burden upon the ratepayers beyond what would have been incurred under the old arrangements of contracting for this work.

Digitized by Google

MOTOR TRAFFIC.

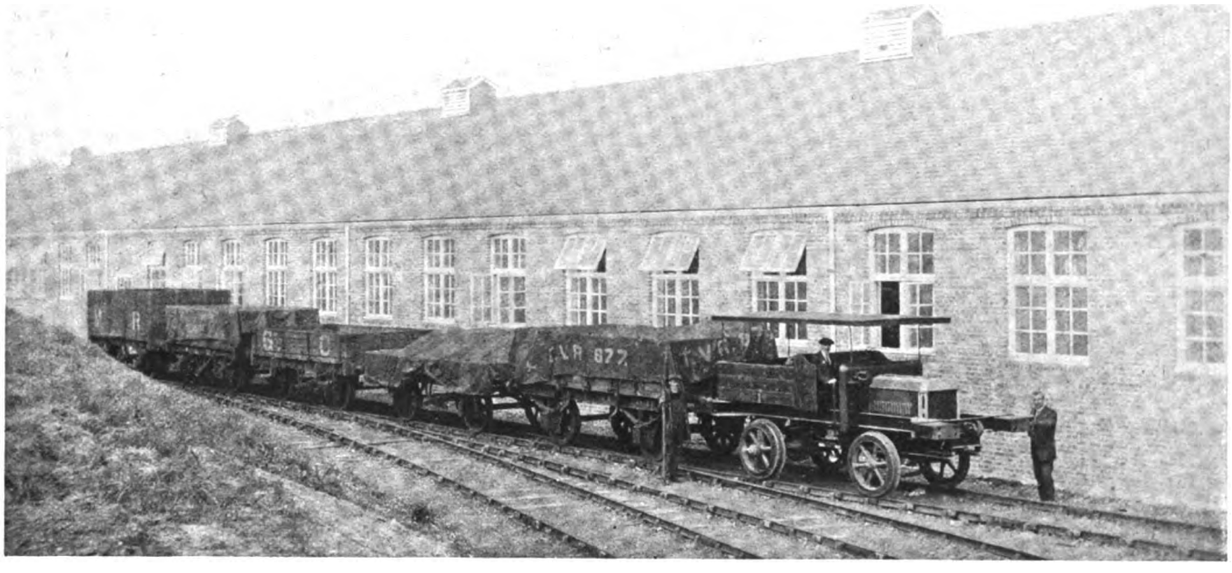
PRECEDENCE AMONG PASSENGERS.

The necessity of giving precedence to certain classes of passengers is a question engaging the attention of proprietors of omnibus services. By the East Kent Traction Company it is proposed to give a preference to long distance travellers.

At Sheffield the general manager of the tramways and omnibus department has informed the Tramways Committee that workmen who make regular and daily use of the omnibus from Middlewood terminus for Deepcar and Stocksbridge during the early hours of the morning were crowded out by persons going on holidays using the vehicles as a means of conveyance for a portion of their journey. Instructions were given that whilst this class of traffic continued the regular riders going to work were to be given precedence. In the case of the crowding out of parents and relatives visiting children at Lodge Moor Hospital, thus causing them to be too late to be admitted during visiting hours, the manager was directed to give precedence on the omnibuses to persons who could produce visiting cards during the hours those are available.

RAIL TRACTOR AT GUILDFORD.

The accompanying photograph shows a Dennis rail motor hauling a train of goods wagons in a siding at the factory of Dennis Brothers at Guildford. In the background is shown their new erecting shop.



A Rail Motor at Dennis Bros' Works.

This rail motor has proved very useful, and carries out efficiently the work for which it was designed.

MOTOR TRUCK STOPPING TESTS.

Tests indicating that a heavy motor truck can stop in a shorter space than a light one running at the same speed have been carried out at Chicago. The cars were 3 and 2-ton trucks, a 6-cylinder touring car, and a ½-ton truck. On weighing the trucks the lighter ones were found to be heavier in front than in the rear. This caused the rear end to skid sideways, and deprive the truck of the necessary weight and traction to make a sudden stop, whereas on the heavier trucks the rear end was the heavier, giving the car the necessary weight to draw it to a stop.

MOTOR INDUSTRY BRANCH COMMITTEE.—The Engineering Trades (New Industries) Committee of the Ministry of Reconstruction is now constituted as follows :—Chairman, Mr. H. C. B. Underdown, vice-chairman, Mr. B. Caillard ; Messrs. E. Powell, J. W. Stocks, L. Walton, E. M. C. Instone, G. M. Young, C. A. Hyde, and H. M. Wyatt.

THE ASSOCIATION OF MOTOR MANUFACTURERS.

At the annual meeting of the Association of British Motor and Allied Manufacturers, Limited, Mr. Manville, who has been president of the association since it was re-organised, was unable to stand for re-election, having taken up the important duties of president of the Association of Chambers of Commerce of the United Kingdom. In proposing the adoption of the report and balance sheet, Mr. Manville referred in detail to the work done by the Association, emphasising its present utility to the industry and its great possibilities of future usefulness. The balance sheet and report were unanimously adopted.

Mr. H. C. B. Underdown was elected president for the ensuing year. Mr. Underdown is chairman and managing director of Commercial Cars, Limited, and a director of Sheffield Simplex Motor Works, Limited. He is also chairman of the motor industry branch committee of the Engineering Trades Committee of the Ministry of Reconstruction, and at present holds the position of director of agricultural machinery at the Ministry of Munitions. He has for the past two years been chairman of the commercial vehicle section of the association.

Mr. Bernard Caillard was elected vice-president. Mr. Caillard is a director of Wolseley Motors, Limited, and managing director of the British Lighting and Ignition Company. In the latter capacity he has for the past year been chairman of the accessories and components section of the association. He is also vice-chairman of the motor industry branch committee.

The executive at present consists of the president, vice-president, and ex-president, and of representatives of each section. The office of chairman and vice-chairman of the sections are filled as follows :—

Section of Private Car Manufacturers.—Chairman, Mr. E. Howell (Humber) ; vice-chairman, Mr. L. Walton (Vauxhall).

Commercial Vehicle Section.—Chairman, Mr. H. C. B. Underdown (Commercial Cars) ; vice-chairman, Mr. F. Churchill (J. and E. Hall).

Motor Cycle Section.—Chairman, Mr. J. W. Stocks (Components) ; vice-chairman, Mr. C. A. Hyde (B.S.A.).

Accessories and Components Section.—Chairman, Mr. Bernard Caillard (British Lighting and Ignition Company) ; vice-chairman, Mr. H. Johnson (Lucas).

A number of special committees are also in being. These include an Overseas Trade Committee under the chairmanship of Mr. Powell, and a committee under the chairmanship of Mr. Underdown dealing with the formation of a Research Association. The association is now very fully representative, receiving the almost unanimous support of the British motor industry. This is important in view of the fact that the Government frequently desires to take the opinion of associations fully qualified to speak for various British industries.

Digitized by Google

MOTOR TRAFFIC.

"SAFETY FIRST" PROPAGANDA.

Reproductions are given on this page of three posters which were issued by the London "Safety First" Council during the first year of their existence. For the drafting of the placards the Council secured the aid of special committees composed of members who have a practical acquaintance with the dangers of the road and the results arising from the neglect of ordinary care on the part of drivers and of school children.

The placards have been widely distributed among tramway, motor, and horse drivers, besides the elementary and secondary schools in Greater London. In many car sheds, garages, stables, and schools care has been taken to give the publications prominent display, and in some instances they have been mounted on cardboard for preservation.

During the present year the Council are extending their activities to the inculcation of safety principles in industrial life, as well as instituting local propaganda through the medium of public meetings to be held in town halls throughout the Metropolitan area.

LONDON "SAFETY FIRST" COUNCIL

Hints to Drivers of Horsed and Motor Vehicles, and to Cyclists

IN the Metropolitan area there were 66,199 accidents in 1916, of which 633 proved fatal. It is considered that a number of these accidents are avoidable and an appeal is made to Drivers of all classes of vehicles TO USE AS MUCH CARE AND DISCRETION AS THEY POSSIBLY CAN. The following hints will if acted upon reduce the number of accidents

1 HAND SIGNALS TO BE GIVEN IN ADVANCE.

2 COMING OUT OF SIDE STREETS, OR YARDS.

3 FRONT AND REAR LIGHTS AFTER SUNSET.

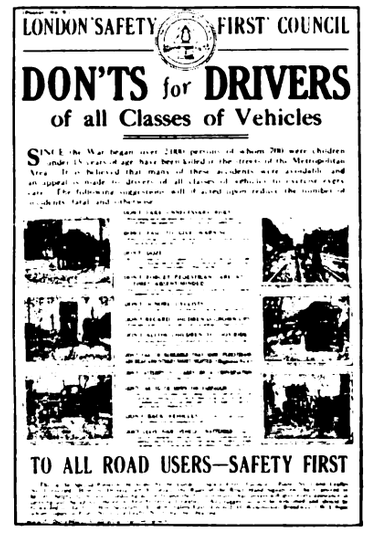
4 RULE OF THE ROAD—"KEEP TO THE LEFT."

5 OVERTAKING.

6 TURNING.

7 LIMITED VIEW AHEAD.

TO ALL ROAD USERS—SAFETY FIRST

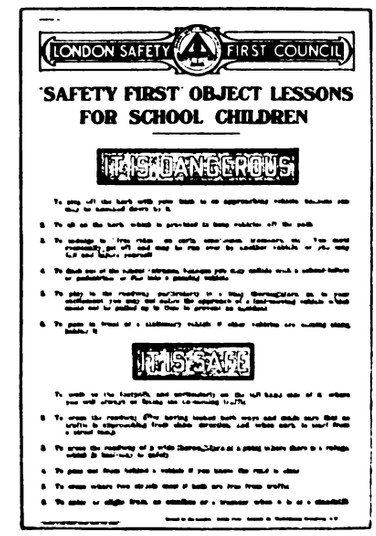

LONDON "SAFETY FIRST" COUNCIL

DON'TS for DRIVERS

of all Classes of Vehicles

SINCE the War began over 21000 persons, of whom 700 were children under 15 years of age, have been killed in the streets of the Metropolitan Area. It is believed that many of these accidents were avoidable and an appeal is made to drivers of all classes of vehicles to exercise every care. The following suggestions will if acted upon reduce the number of accidents fatal and otherwise.

TO ALL ROAD USERS—SAFETY FIRST


LONDON SAFETY FIRST COUNCIL

"SAFETY FIRST" OBJECT LESSONS FOR SCHOOL CHILDREN

IT IS DANGEROUS

IT IS SAFE

DRIVERS' CHAMPIONSHIP.

The Commercial Motor Users' Association have issued the results of the annual examination of drivers of industrial and commercial motor vehicles. Owing to the war there was again no scrutiny of the machines and no parade on the Victoria Embankment. In his report to the committee of the Association the examiner stated that in view of the stress of the present times the attendance at the examination was exceedingly good, and the quality of the papers was better than in any previous year, the papers of the champion drivers being specially worthy of merit. Appended are the results:—

Championship Petrol Examination.—Champion driver, £10, B. Spurrier (employer, E. Nelson and Company, Limited); £5, diploma, and medal, W. G. Hayter (employer, H. G. Burford and Company, Limited).

Championship Steam Examination.—Champion driver, £10, diploma, and medal, W. R. Davey (employer, Wm. Whitley, Limited); £5, diploma, and medal, W. Stevens (employer, Sun Flour Mills Company, Limited).

SAFETY LEAGUE RULES.

The United Railways and Electric Company, of Baltimore, Md., recently inaugurated the Safety League movement. In some instances whole school classes took an interest in the matter and applied for membership. A neat button and card of membership are forwarded to all applicants, the card reading as follows:—

I.....promise that:

(1) Before crossing a street I will look in both directions to see that no vehicles are near, and if the street is clear I will cross quickly, without stopping.
(2) I will always cross streets at the corner crossing, because it is dangerous to cross in the middle of blocks.
(3) I will not play in streets on which there are car lines, or where many automobiles and other vehicles pass.
(4) I will not hang on behind cars, or automobiles or wagons.
(5) I will not throw stones at cars or other vehicles.
(6) I will assist younger children in crossing the streets.
(7) I will not stand near the kerb of pavements when vehicles are passing close to it.
(8) I will not use roller skates, coasters, or sleds on streets upon which there are car tracks.
(9) I will do all I can to be safe, and to encourage others to live up to these safety rules.

DENNIS BROTHERS' POST-WAR OUTPUT.—The directors of Messrs. Dennis Brothers, motor vehicle and fire appliance manufacturers, have completed arrangements whereby after the war their Guildford Works will be able to complete fifty vehicles a week to meet the increased demand which is anticipated for their lorries. The entire output is at present taken by the Government except in instances where vehicles are permitted to be supplied to firms engaged upon war work.

Class II.—*Petrol Written Examinations.*—£5, certificate, and badge, C. F. Bidmead (employer, Westminster Electric Corporation, Limited); equal second, £3, certificate, and badge each, D. Cummings (employer, Schweppes, Limited) and J. P. Cox (employer, The Gas Light and Coke Company); £2 and certificate, E. Makinson, (employer, Bryant and May, Limited).

Class II.—*Steam Written Examinations.*—£5, certificate, and badge, O. Hornsby (employer, Sun Flour Mills Company, Limited); equal second, £3, certificate, and badge each, J. Copsey (employer, Gas Light and Coke Company), and W. Polley (employer, Bryant and May, Limited); £2 and certificate, J. Grove (employer, E. Nelson and Company, Limited).

Class II.—*Oral Examination.*—£3, certificate, and badge, G. H. Warren (employer, Bluthner and Company, Limited); £2, certificate, and badge, F. B. Mobbs (employer, Bryant and May, Limited).

Arrangements are well in hand for the holding of the 1919 inspection and examinations, and full particulars thereof can be obtained from the secretary, Commercial Motor Users' Association, Pall Mall, London, S.W.1.

CHARGING STATIONS FOR ELECTRIC VEHICLES.—The General Vehicle Company, whose present address is 4, Southampton Row, London, W.C.1, have issued in folder form a map showing the charging stations for electric vehicles in a radius of 20 miles of London. The map not only gives the location of the station, but also a key which refers to the number on the map and the names and addresses of the proprietors of the station, together with the telephone numbers and particulars of whom inquiries should be made. Useful information for drivers of electric vehicles is also given, and a number of "Hints to Drivers" specially recommended by the "Safety First" Council. The General Vehicle Company will be pleased to furnish copies to any of our readers.

Digitized by Google

MOTOR TRAFFIC.

ENDOWMENT SCHEME FOR EMPLOYEES.

The directors of the Dunlop Rubber Company, Limited, have inaugurated, for the benefit of the male staff, an endowment insurance scheme, which is considered to be an improvement upon schemes adopted by other employers. The primary object of the fund is to secure the welfare of the dependent rather than that of the man employed, and this view received a substantial confirmation from grateful letters from Dunlop men on active service, to whose dependents the company makes payments. The company decided that the best policy would be to take out endowment policies of insurance on the lives of men who have been with them sufficiently long, and have attained such a position that they have proved themselves suitable in every way to become attached to the company permanently. The Dunlop scheme is non-contributory, and yet it is contributory in that a man is expected to insure himself personally, and it has been a source of considerable surprise to the company to find out how many of its employees were either not insured at all or were insured inadequately.

To meet the point—that length of service should be rewarded in greater measure than ability which is recognised by salary—a formula was devised which, as will be seen from the tables in the booklet, provides an equitable basis. The booklet can be obtained from the secretary of the Endowment Fund, Dunlop Rubber Company, Limited, Aston Cross, Birmingham, on application, and the company will welcome inquiries from those interested. As salaries increase so are additional policies taken out, so that there is every incentive to a man to increase his efficiency, obtain a higher salary, and become endowed for an additional amount. A man who is receiving a salary less than the qualifying salary does not actually lose if he receives the qualifying salary subsequently, because ultimately all his past service counts in making the calculation of the endowment for him. The scheme has the advantage of obviating trouble which necessarily arises in dealing with the institution of a pension scheme, due to the fact that men of varying ages receiving varying salaries have already served varying years of service and are likely to serve further varying years of service.

With a view to assisting members of the staff to become qualified for the insurance the company have established a novel educational scheme (in conjunction with the Birmingham Educational Authorities) which provides tuition in the use of the actual forms used in the company's business, and every assistance is given to employees to make definite progress from one department to another.

ACROSS THE PENNINE RANGE.

Twelve years' continuous service stands to the credit of the 4-ton Commer car shown in the accompanying illustration. The vehicle was delivered by Messrs. Grace and Sutcliffe, of Keighley, to its

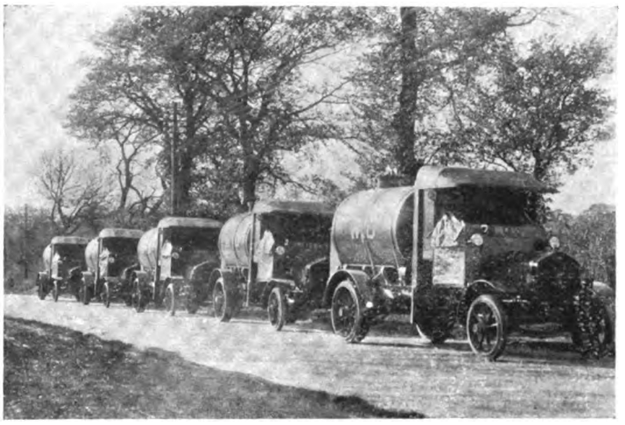
A Four-Ton Commer Car.

first owners in May, 1906. In the service of its present owner it regularly makes several journeys a week between Huddersfield and Colne, each time, of course, surmounting the famous Pennine Range.

NATURAL GAS FOR A MOTOR CAR.—Gas which is being given off at the top of a bore tube, sunk for water at Messrs. Hoyles' works at Huddersfield, has been stored in large quantities. It is being used to run a motor car and for heating boilers.

ALBION PETROL WAGONS.

The subjoined illustration shows part of a convoy of Albion wagons fitted with 800-gallon petrol tanks, *en route* for delivery to the War



Department. These vehicles are used extensively both at home and abroad, the type having been developed by the Albion Motor Car Company from an early stage of the war.

DUNLOP RUBBER CHAIRMANSHIP.

The directors of the Dunlop Rubber Company have appointed Sir Arthur du Cros, Bart., M.P., to the chairmanship. As the "head and front" of this gigantic business for many years, it is only fitting that Sir Arthur should be endowed with the titular distinction. He has seen the manufacture of Dunlop tires rise from a small affair with a working capital of some £17,000 to the immense undertaking it is now, capitalised at £6,000,000, with nearly a dozen subsidiary and allied companies, each yielding substantial profits, owners of its own factories and freeholds, and with depots practically all over the world. These wonderful developments are chiefly due to the foresight and enterprise of the new chairman, who is also responsible for the acquisition of the rubber plantations, which are among the company's greatest assets. Another of Sir Arthur's schemes—the provision of cotton mills for the manufacture of woven cotton duck for tire casings—has been equally successful, and extension in this direction is likely to be found necessary.

Sir Arthur du Cros' appointment ensures continuity of the progressive and enterprising policy which has always characterised the Dunlop Company, whose organisation and resources have been of great assistance to the Government in the conduct of the war.

WEST OF ENGLAND CENTRE OF THE C.M.U.A.

A West of England Centre of the Commercial Motor Users' Association has recently been formed. This decision was arrived at by a meeting held at the Grand Hotel, Bristol, presided over by Mr. H. F. Cooper, secretary of the Bristol Tramways and Carriage Company. A statement as to the benefits to be derived from the formation of a centre was made by Mr. F. G. Bristow, general secretary of the association, and at the conclusion of the speech the chairman said that Mr. Bristow had favourably impressed them regarding the importance and usefulness of the association, and the desirability of forming a local centre. Mr. W. G. Verdon Smith, managing director of Bristol Tramways and Carriage Company, was elected chairman of the centre, and among those appointed on the committee were Mr. W. E. Hardy, general manager of Bath Electric Tramways Company, and Mr. H. F. Cooper, with Mr. Verdon Smith as chairman. The committee is thoroughly representative. Mr. W. E. Chapple (Car and General Insurance Company) was appointed hon. secretary.

LONDON'S LAST HORSED FIRE ENGINE WITHDRAWN.—The London Fire Brigade is now equipped with engines that are all motor propelled, the last horse-drawn machine having recently been taken out of service. In a short time all the escapes and ladder vans will be either propelled by electric battery or petrol.

Digitized by Google

MOTOR TRAFFIC.

GRANTS FOR MOTOR OMNIBUSES.

STATEMENTS IN THE HOUSE OF COMMONS.

Mr. GILBERT, in the House of Commons on June 26, asked the Minister of Munitions the names of the seventeen routes in South-East London on which motor omnibuses receive financial grants from his department; on which routes are competing municipal tramways; for how long these financial grants have been given, and what amount was paid in the year 1917 or the nearest complete year; and will he state if any such grants have been paid or offered to municipal tramways who have supplied special and extra service for munition workers in South-East London?

THE FINANCIAL SECRETARY TO THE MINISTRY OF MUNITIONS (Sir L. Worthington Evans).—Financial grants have been made in respect of 17 services for the twelve months ending 30th June, 1917, amounting to £44,312. No claim has been put forward by the tramway companies, and the question of the payment of a grant to them has therefore not arisen. The names of the seventeen routes are as follows:—

(75) Plumstead and Croydon; (75a) Church Manorway and Sydenham; (72) Woolwich and Croydon; (99) Poplar and Erith; (99a) Poplar and Crayford; (109) Penge and Woolwich; (93) Sidcup and Woolwich; (53) West Hampstead and Plumstead; (53a) Charing Cross and Plumstead Common; (15) Ladbroke Grove and Gallions; (101) North Woolwich and Wanstead; (101b) North Woolwich and Cranbrook Park; (21a) Wood Green and Woolwich; (56) Mile End and Milwall; (103) Cubitt Town and Blackwall; (108) Blackwall Lane and Poplar; (110) Farnborough and Crayford.

These routes are in competition with the tramways, as follows:—(99 and 99a) between Blackwall Lane and Plumstead; (109) between Eltham and Woolwich; (93) between Eltham and Woolwich; (53 and 53a) between Westminster Bridge and Woolwich; (101 and 101b) between the "Earl of Essex" and North Woolwich; (15) between the East Ham Town Hall and Gallions; (21a) between Shooters Hill Road and Woolwich.

Mr. GILBERT.—If the tramway authorities put forward any claim for consideration in the same way as the omnibus companies, will the hon. gentleman undertake to consider it?

Sir L. WORTHINGTON EVANS.—Of course, I am bound to consider any claim put forward, but the services rendered appear to me to be different.

Mr. PERCY HARRIS.—Has the Minister got authority from the Treasury for this £44,000?

Sir L. WORTHINGTON EVANS.—I have no doubt we have, but if the hon. member wants a very precise answer I must ask for notice.

Mr. GILBERT asked the Minister of Munitions (1) whether any financial grants to motor omnibus companies have been paid for any district of London other than the South-east district, and, if so, what districts; and for what districts further negotiations are proceeding for future grants, and with which motor omnibus companies; (2) whether he will state the average earnings per mile of the omnibuses in South-east London and the average earnings of omnibuses in the remainder of the Metropolis on which financial grants from his department have been paid; will he state if all the grants have been paid to one or more omnibus companies; and will he give the names of the companies who have received such grants?

Sir WORTHINGTON EVANS.—No financial grants have been paid to omnibus companies in any districts of London other than the South-east district, though a number of private hire arrangements exist, whereby certain State-owned factories and controlled establishments in the London area have hired omnibuses for conveyance of workers where the travelling facilities are inadequate. The earnings per mile of the omnibuses in South-east London were given to my right hon. friend in confidence, and I cannot disclose them. The grants have been made to the London General Omnibus Company.

On July 1 Mr. GILBERT asked if any conditions as to cheap fares being charged to workpeople travelling on the various routes were made with the London General Omnibus Company when grants were given for motor omnibuses, and whether the company allowed any passengers to travel on any of the subsidised routes at workmen's fares at the same price as municipal tramway services allowed workpeople to travel.

Sir L. WORTHINGTON EVANS replied that the answer was in the negative, but cheap return fares had been instituted by the General Omnibus Company at the request of the Ministry, these being restricted to the employees of the Arsenal. In some cases the fares were the same as those charged by the tramway service. In some cases they were higher, but in no case lower. In reply to a further question, Sir Worthington said that the amount claimed by the London General Omnibus Company for 1917-18 would be larger than that paid for 1916-17. Negotiations were proceeding for a revision of the arrangement with the company, including the provision of additional services on existing routes.

COMPRESSED GAS TESTS.

EXPERT SUB-COMMITTEE APPOINTED.

The President of the Board of Trade has appointed a sub-committee to carry out experiments and tests in connection with the determination of factors affecting portable gas generating plants and the commercial use of gas for traction purposes in containers at high pressure, together with questions relative to liquefaction, absorption and enrichment, and in regard to improvements in the existing arrangements for effecting the admixture of gas and air under varying conditions. The sub-committee comprises Sir Boverton Redwood (chairman); Lieut.-Col. R. K. Bagnall-Wild, R.E.; Mr. W. Worby Beaumont, M.Inst.C.E.; Major A. McN. Cooper-Key; Professor C. Vernon Boys, F.R.S.; Major B. Hopkinson, F.R.S.; Mr. E. S. Shrapnell-Smith, and Mr. S. Straker, M.I.Mech.E.; with Mr. C. H. Lamb, of H.M. Petroleum Executive, as secretary.

The committee are carrying out their work in conjunction with the Aeronautical Inspection Directorate of the Royal Air Force, the London General Omnibus Company's engineer, and the Gas Light and Coke Company's chemists. Under section 17 of the Gas Traction Committee's report, assistance in the development of the use of compressed gas is being given to the London General Omnibus Company, the tramway department of Liverpool Corporation, and the motor omnibus department of Eastbourne Corporation.

MOTOR INDUSTRY HONOURS.

King's Birthday Honours were conferred upon the following gentlemen:

C.M.G.

Lieut.-Col. R. K. Bagnall-Wild, Aircraft Inspection Department, formerly of the War Office Mechanical Transport Centre and ex-president of the Institution of Automobile Engineers.

KNIGHT COMMANDERS (K.B.E.).

John E. Thornycroft, director Messrs. J. I. Thornycroft and Company, Limited.

Percival L. D. Perry, Director of Mechanical Warfare in the Ministry of Munitions, and head of the Ford Motor Company in England.

COMMANDERS (C.B.E.).

Colonel Wm. Ed. Donohue, Inspector of Mechanical Transport, Eastern theatres of operations.

E. M. Iliffe, Controller Machine Tool Department, Ministry of Munitions.

Wm. Malesbury Letts, managing director Crossley Motors, Limited.

Ed. Shrapnell-Smith, chairman Standing Joint Committee of Mechanical Road Transport Associations, and Chief Economy Officer of Petroleum Executive.

OFFICERS (O.B.E.).

G. H. Baillie, Chief Technical Adviser of Dilution of Labour, Ministry of Munitions, a member, and formerly chairman, of the Expert and Technical Committee of the R.A.C.

F. W. Hudlass, consulting engineer to the Motor Ambulance Department, British Red Cross Society (London Headquarters), and engineer to the R.A.C.

A. J. McCormack, chairman of the Labour Advisory Committee of the Ministry of Labour, and technical managing director of Wolseley, Limited.

T. C. Pullinger, managing director of Arrol-Johnston, Limited.

A. Wormald, works manager Rolls-Royce, Limited.

PERSONAL ITEMS.

Mr. E. W. DELACOUR, publicity manager of the Anglo-Mexican Petroleum Company, has been elected president of the Society of Motor Advertising Managers for the ensuing year.

Mr. HERBERT O. DAVIES, of John I. Thornycroft and Company, Limited, has again been elected honorary secretary and treasurer of the Society of Motor Advertising Managers.

Mr. CHAS. ASHTON LISTER, J.P., the chairman of the M. L. Magneto Syndicate, Limited, of Coventry, has been gazetted a Commander of the Order of the British Empire.

Digitized by Google

MOTOR TRAFFIC.

MOTOR VEHICLES FOR MUNICIPALITIES.

TILBURY URBAN COUNCIL are obtaining a motor fire engine.

TYNEMOUTH CORPORATION are purchasing a motor ambulance.

TORQUAY CORPORATION have agreed to obtain a 5-ton Foden steam wagon.

HULL CITY COUNCIL have decided to purchase an electric vehicle at an estimated cost of £1,160.

KIRBYMOORSIDE RURAL COUNCIL are purchasing two motor wagons fitted with tipping bodies.

HAYWOOD CORPORATION have applied for sanction to borrow the money to purchase two motor vehicles.

THORNABY COUNCIL have applied for sanction to borrow the money for the purchase of a motor fire engine.

INVERNESS COUNCIL have planned to instal a complete service of electric vehicles for refuse collection and disposal.

POPLAR COUNCIL are extending their motor garage, and have accepted an estimate of £1,254 for carrying out the work.

SOUTH SHIELDS CORPORATION have accepted the tender of Electromobile (Leeds), Limited, for the supply of an electric vehicle.

RICHMOND COUNCIL are purchasing steam wagons fitted with interchangeable bodies for use in the surveyor's department.

BRENTWOOD URBAN COUNCIL have under consideration a recommendation for the purchase of a motor to haul their fire engine.

BARNET URBAN COUNCIL have accepted the tender of Leyland Motors, Limited, for the supply of a motor fire engine at £1,160.

HASLINGDEN URBAN COUNCIL have under consideration a recommendation for the purchase of motor wagons for the collection of refuse.

MOTOR TRAFFIC NOTES.

MOTOR TRADE ASSOCIATION.—Mr. Leslie Walton, one of the joint managing directors of Vauxhall Motors, Limited, has been elected president of the Motor Trade Association.

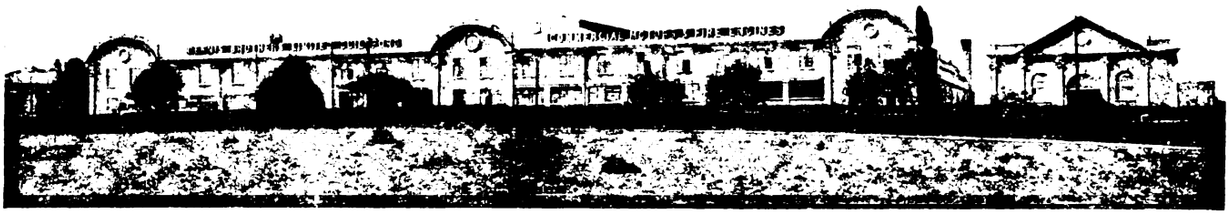
TRANSPORT AS AN AID TO HOUSING AT BRISTOL.—The Corporation have asked the sanction of the Local Government Board to erect 5,000 houses in village suburbs on the outskirts of the city. All the sites are within convenient motor omnibus and tramway communication with the city.

EASTBOURNE OMNIBUS AND COMPRESSED GAS.—The Motor Omnibus Committee reported at the last meeting of the Town Council that the gas compressor was sufficiently completed to make an experimental running test, which proved highly satisfactory, and there was every reason to believe that the scheme would prove a success.

CHARGING OF VEHICLE BATTERIES AT BLACKBURN.—In the annual report of the electrical engineer of Blackburn Corporation it is stated energy had been supplied for a number of electrical vehicles operating in the town, and it is expected that this class of demand will rapidly increase, as the advantages of electrical vehicles are many, and the running cost very low.

EXCURSION VEHICLES RUNNING AT HOVE.—The Southdown Motor Services, Limited, have been informed that Hove Corporation propose to renew the licences of six motor coaches which run pleasure trips to places outside the borough. The Watch Committee disagreed with a proposal that the services should be discontinued owing to the restriction on the supply of gas.

ROAD MOTORS FOR AMERICAN RAILWAYS.—Provision has been made in the Bill concerning the Government control of U.S.A.



A View of the Administrative Portion of the Works of Messrs. Dennis Brothers, Limited, of Guildford.

[The building on the right is the power station, which is equipped with three 250-h.p. oil engines direct coupled to dynamos.]

GILLINGHAM CORPORATION have informed the War Department that providing the latter contribute a portion of the cost they are willing to instal a motor fire engine.

WORTHING CORPORATION have received a report from the surveyor recommending the purchase of an electric vehicle from Ransom, Sims and Jeffries at a cost of £1,033.

OSWESTRY COUNCIL have instructed the surveyor to obtain information as to the working of motor vehicles for street cleansing in various towns, and to report thereon.

CARDIFF CORPORATION have under consideration a recommendation whereby the whole of the street cleansing and refuse collection services would be carried out by motor machines.

GLASGOW CORPORATION have authorised the City engineer to purchase two second-hand motor cars at £250 each. The object of this purchase is to enable the engineer to reduce the number of emergency men employed at the various depots by a more effective use of the staff.

BRADFORD CORPORATION have renewed a contract with the Dunlop Rubber Company, Limited, for the supply of solid rubber tires to all the motor vehicles employed in the tramways department. The arrangement is for an indefinite period on the terms of the last contract, subject to six months' notice from either party for its determination.

SWANSEA CORPORATION have had under consideration a report from their engineer with reference to a visit paid by the chairman and vice-chairman of the Public Health Committee and himself to Birmingham, Nottingham, Sheffield, Cheltenham, and Blackpool to obtain information with regard to electric battery vehicles. As a result a recommendation that two Edison vehicles be obtained, at an estimated cost of £2,457, has been agreed to.

railroads for the purchase of motor trucks to relieve transportation if this step is found advisable by the President. The clause provides that 500,000,000 dollars may be appropriated out of the Public Treasury from any funds not otherwise appropriated.

MOTOR TRANSPORT EMPLOYERS' FEDERATION.—A London and district branch of the Motor Transport Employers' Federation has been established, with Mr. W. G. Lobjoit, J.P., as chairman, and Mr. F. G. Bristow, 83, Pall Mall, London, S.W.1, as secretary. One of the main objects of the Federation is to bring into existence Conciliation Boards on the lines of the Whitley Report.

COST OF MOTOR EQUIPMENT FOR U.S.A. CAMPS.—It is reported from Washington that the motor vehicle equipment for the 33 divisional camps of the United States army has cost 54,000,000 dollars. A large part of this sum was for trucks. Each division uses ten light trucks and 343 three-ton trucks. The cost of building repair shops and of heating garages during the cold season totals to 8,700,000 dollars.

THE ECONOMY OF STEAM MOTOR VEHICLES.—Capt. A. D. Provand, of the Mechanical Transport Department, speaking at the annual meeting of the Manchester Steam Users' Association, referred to the increased use of steam as against petrol in the propulsion of heavy vehicles, and stated that in the matter of economy experience showed that steam had the advantage by five to one. This fact would have an important bearing after the war, as it had even now.

GOODS CONVEYANCE BY WAR DEPARTMENT LORRIES.—The Under-Secretary for War, replying in the House of Commons to Colonel Gretton, said he was not aware that any motor lorries driven by army drivers have travelled empty from Scotland and the north of England to the south. If his hon. and gallant friend was referring to lorries delivered by manufacturers it was the practice whenever possible, to use such lorries for the conveyance of goods.

Digitized by Google

MOTOR TRAFFIC.

STEAM LORRY COSTS AT CARDIFF.—In a report presented to Cardiff Corporation by the city treasurer, the following particulars are given of the working costs of four steam vehicles during a period of 44 weeks :—Four motors, at work 1,000 days. Total expenditure, £934 18s. (£115 3s. 9d. thereof for maintenance, repairs, and renewals), being 18s. 8d. per day, or, excluding maintenance, etc., 16s. 5d. per day.

OBJECTION TO TWO LAMPS ON A VEHICLE.—The National Union of Horse and Vehicle Owners is agitating for the cancellation of the Defence of the Realm Act regulation which requires a lighted lamp on the near side in front. They have informed the Home Secretary that the use of the lamp referred to is unnecessary, and that the material employed could be better utilised for more important national purposes. Motorists, on the other hand, have long advocated two front lamps for all vehicles.

INSPECTION OF LICENCES IN THE METROPOLIS.—Under the powers conferred upon the police and military authorities at the time that petrol restriction licences were issued, there was an inspection of permits carried by private car and motor cycle drivers on all the main roads out of London on June 26. An inspection post was also established opposite the Horse Guards' Avenue on the Victoria Embankment. The civil police stopped all private cars, the military police paying attention to army and navy vehicles.

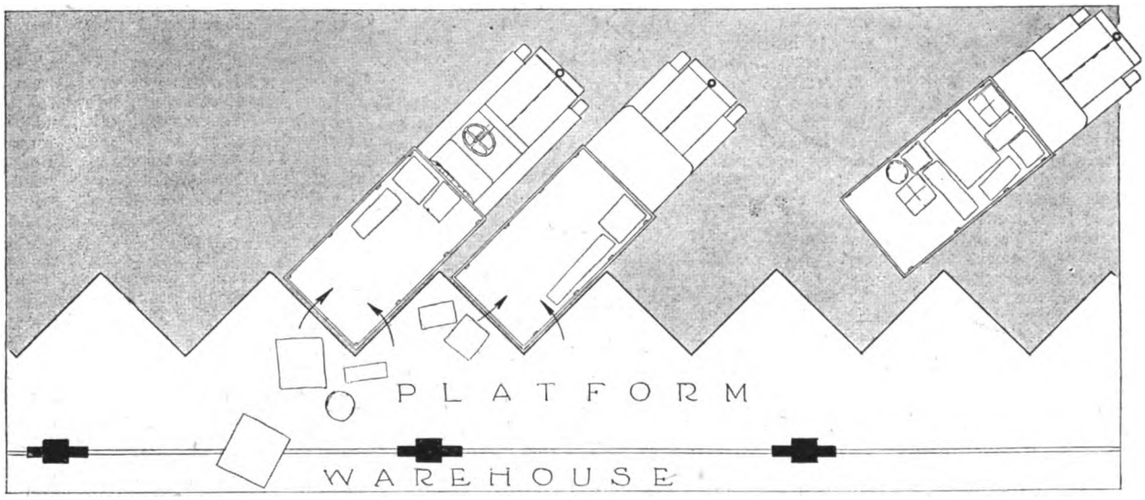
GREAT DECREASE IN U.S.A. TRUCK EXPORTS.—In March, 1918, only 143 trucks were shipped from the United States to France and 100 to England. The value amounts to 876,500 dollars, whereas the valuation for the parts shipped during the same period is 854,228 dollars. During March, 1917, there were 1,040 trucks shipped, which were valued at 2,961,389 dollars. The figures as given for this year show almost an 80 per cent. decrease in the exports to the Allies, while there is a decrease in the valuation of nearly 70 per cent.

PETROL FOR CABS UNDER URGENT CIRCUMSTANCES.—On June 18 an Order was issued amending the Motor Spirit (Consolidation) and Gas Restriction Order, for the purpose of permitting petrol or petrol substitute, obtained by licence, to be used for driving a cab "on any sudden or urgent necessity where life or limb is, or may be, endangered," and for the conveyance of a sick or injured person to a place where he may receive treatment, or to or from a hospital or nursing home. A motor cab may also be used for visits to a person who is dangerously ill. Under the original Order private vehicles only might be used for the aforementioned purposes.

BRIGHTON AND HOVE SERVICES OF TILLING, LIMITED.—The whole of the motor omnibus services of Hove and Brighton are now run by Thos. Tilling, Limited. The company have recently received from Hove Corporation licences for 49 petrol and 12 battery omnibuses, but they have arranged to reduce the services over certain roads owing to the difficulty experienced by the Council in obtaining materials for the repair of the same. The company propose to use the electric vehicles in the event of additional petrol restrictions being imposed. These machines were purchased from the late Brighton and District General Omnibus Company, and had been in use for many years.

MOTOR QUESTIONS IN AUSTRALIA.—At the request of Adelaide Municipal Council, the State Government have made compulsory the provision of efficient silencers on motor vehicles. The Victorian Country Roads Board have again asked the Government to introduce legislation for (*a*) a general maximum speed limit for the whole State ; (*b*) power to reduce speed below that limit on certain roads or sections of roads where it is considered that the general speed limit allowed under (*a*) would be dangerous to the road users or destructive to the road ; (*c*) power to prohibit chars-a-banc traffic on certain specified roads. The Board assert that unless some protective measures be adopted the cost of road maintenance will soon reach proportions that will be beyond the financial resources of the municipalities and the Board.

TAX ON U.S.A. TRUCKS COMPETING WITH RAIL AND WATER TRANSPORT.—So far there is by no means a general collection of the tax referred to in the following Act, which was passed for the United States on November 1, 1917 :—" On and after November 1, 1917, there shall be levied, assessed, collected, and paid (*a*) a tax equivalent to 3 per centum of the amount paid for the transportation by rail or water or by any form of mechanical motor power when in competition with carriers by rail or water by freight consigned from one point in the United States to another." The failure to put it into general operation is attributed to slowness in providing machinery for collection.



Saw-Tooth Loading Platform of the Ninth Street Warehouse, Cleveland, Ohio.

[This is designed to save motor wagon loading time by permitting both sides and end loading and unloading respectively, at the same time. Each vehicle has a greater length of platform and takes up less room in front of the platform and requires less turning.]

MUNICIPAL SWEEPERS AND WAGONS.—In showing the members of the West Midland District of the Institution of Municipal and County Engineers the various engineering features of Birmingham, the city engineer mentioned that the Corporation have two 18-H.P. motor sweeping machines, made by the Lacre Motor Car Company. The width swept by the brush is about 5 ft. 10 in. The machine is fitted with a water tank to hold 150 gallons to enable a light spray to be delivered through two nozzles in advance of the brush to prevent dust rising. The speed recommended is from eight to ten miles per hour on paved roads, and about six miles per hour on macadam. This machine will do as much work as three horse-drawn brooms. There are also in use several steam tipping wagons made by Foden, Limited, Aveling and Porter, Limited, and the Yorkshire Commercial Motor Company, Limited.

NEW SPEED REGULATIONS IN AN AMERICAN STATE.—The maximum speed allowances for pneumatic and solid tire vehicles in Great Britain appear out of date beside the new limits enacted by Maryland State Legislature. In the drawing up of the measure the Senate consulted the Auto Club of Maryland. For solid-tired vehicles weighing 2 tons or less the speed limit has been reduced to 25 miles maximum, and for 2 tons and not in excess of 6 tons, 15 miles. Over 6 tons it is 12 miles, which is the maximum for most solid-tired commercial vehicles in this country. In thickly-populated places the maximum speed for all motor vehicles is to be 15 miles instead of 12 miles, and in outlying urban districts 18 miles. In the open country a speed up to 60 miles is to be permitted to pneumatics provided reasonable care is taken by the driver. Penalties for exceeding that limit range from 100 dollars to 1,000 dollars.

Digitized by Google

THE Tramway & Railway World
WITH MOTOR TRAFFIC SECTION

Founded 1892. LONDON, AUGUST 15, 1918. VOL. XLIV.

SINGLE-PHASE LOCOMOTIVES OF THE SWISS FEDERAL RAILWAYS, AND NEW TYPES OF THE ATELIERS DE CONSTRUCTION OERLIKON.

By Professor HUGO STUDER, Engineer, Zurich.

The Directorate of the Swiss Federal Railways ordered in May, 1917, four trial locomotives from three Swiss firms of specialists for the electrification of the Gotthard Railway. These locomotives are now in course of construction, and will be delivered shortly. It was originally intended to carry out the trial runs with the locomotives in regular service on the Scherzligen-Brig section of the Bern-Loetschberg Railway (84 km.). Since then, however, it has been decided to electrify also the next section, viz., Scherzligen-Bern (38 km.), so that the line on which electric traction can be maintained, together with the 14 Loetschberg locomotives, now measures 116 km. The directorate

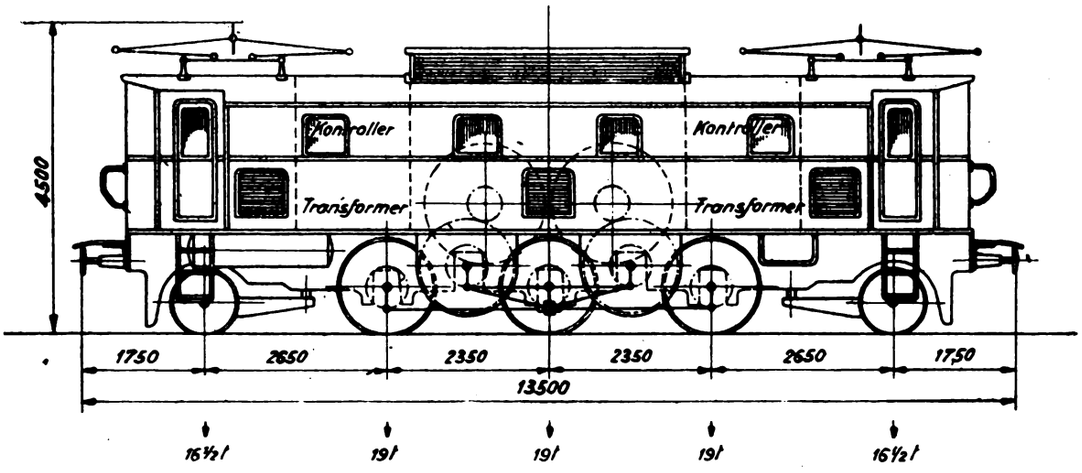


Fig. 1.—Small Electric Express Locomotive (Type 1C1).

of the Swiss Federal Railways has in the meantime ordered from the same three firms 20 additional locomotives to be delivered in the second half of 1919, and these are intended to serve as a first service group for the Gotthard line. This programme is to be supplemented within the next few months by trials with single couplers.

In the following notes a few general particulars are given of the four trial locomotives referred to above, and of those for the Gotthard without, however, entering into details of design.

The Swiss Federal Railways have in view provisionally the application of three types, viz., a smaller express locomotive, a larger express locomotive, and a goods locomotive, provision being made that one type can replace the others under specific conditions. The following are principal extracts from the specification :—

(*a*) The express train locomotives must be able to make the return journey, Lucerne-Chiasso three times within twenty-four hours, with a stoppage at the termini of 15 minutes, the train weight (exclusive of the locomotive weight) being 430 tons, a small express train locomotive serving as a pilot engine on the inclines above 21 in 100. For the journey Chiasso-Bellinzona the train weight, exclusive of locomotive weight, may be reduced to 350 tons, no pilot engine then being provided. The run on the inclines of 26 in 100, the train weight (always exclusive of locomotive weight) being 215 tons with the small, or 300 tons with the large, locomotives, has to be made at an average speed of 50 km. per hour ; maximum speed, 75 km. per hour.

(*b*) The goods locomotives must be able to complete the journey between Goldau-Chiasso twice within twenty-four hours. The train weight here is to be 860 tons, a second goods locomotive being used for pushing on the inclines above 21 in 100. For the journey Chiasso-Bellinzona, one goods locomotive being used, the train weight may be reduced to 625 tons. On the incline of 26 in 100 a train of 430 tons must be able to travel at an average speed of 35 km. per hour ; maximum speed, 65 km. per hour.

Locomotives of all types must be able to run over track curves of 180 metres and point curves of 114 metres radius. The admissible weights on the trailing axle have been fixed at 12 tons minimum and 16 tons maximum, and for the driving axles at 18 tons. In connection with the goods locomotives a weight of 19 tons has been decided upon for the two middle axles,

Digitized by Google

with a distance of 2 metres between the two, provided that weight on the two end axles is reduced to 17 tons for each. The weight per metre of wheel base length is not to exceed 7 tons. On the downhill journey the locomotives are to be capable of braking at least their own weight.

The trial locomotives ordered, and now in course of construction on the basis of the above data, for which the Swiss Locomotive and Machine Works in Winterthur are building the mechanical parts, are briefly described and illustrated by the accompanying sketches.

The small express locomotive (1C1) of the Ateliers de Construction Oerlikon shown in Fig. 1 has a length of 13·5 metres. This machine is symmetrically constructed, and in general is arranged on the lines of the large Loetschberg locomotive, but with three instead of five coupling axles. The two motors are of the 12-pole compensated single-phase series type built under the Oerlikon patent. Each motor has a normal capacity of 825 B.H.P., measured at the wheel rim, with phase displaced auxiliary fields. They are mechanically inter-connected in the locomotive centre, and rest on the frame, transmitting their power on both sides by spring gears of a speed ratio of 1 : 2·84 to the two blind shafts, which on their part transmit the power by means of a driving triangle with a slot and cable rods to the driving axles, in a manner quite similar to that adopted in the large Loetschberg locomotives.

The electro-pneumatic operated reverser, ceiling fan, and brake apparatus are arranged above the motors, On both sides of the motors are mounted the air-cooled transformers, equipped with step switches and main switches, compressors, etc. The normal tractive forces measured on the wheel amount to 8,900 kg., the maximum 13,500 kg., the capacity being 1,650 B.H.P. per hour at the normal speed of 50 km. per hour and maximum speed 75 km. per hour. The total weight including the electric brake equipment is about 90 tons.

The general arrangement of the large express locomotives (1B+B1) of the Oerlikon Works is illustrated in Fig. 2; they weigh 106 tons each, and have a total length of 16·2 m. Two motors, each of 560 B.H.P. (measured on the wheel), wound with 10 poles, but otherwise similar as regards the design to those of the 1C1 locomotives, are mounted between the two driving axles of each bogie. The motors are carried rather low, and transmit their power by means of sprung gear wheels mounted on the two shaft ends through a blind shaft and slot rod on to the driving wheels. The transformer is carried in the centre of the locomotive frame resting on the two bogies. Likewise the step switches and fan, the auxiliary sets, compressor, and rotary transformer are arranged in the low end parts of the locomotive. The driver's position stands back somewhat from the locomotive ends. By adopting a single transformer the electric arrangements have been greatly simplified; whilst, on the other hand, a somewhat heavy locomotive frame becomes unavoidable. The normal tractive force is 12,000 kg., maximum 18,000 kg., the normal capacity being 2,250 B.H.P.

The operation of these two locomotives is generally devised on the lines of the Loetschberg locomotives, with the difference, however, that the operation of the step switches on the 1C1 locomotives is electro-pneumatic, the number of speed steps furthermore having been increased to 23 in order to secure favourable starting and finer speed adjustment conditions for the normal travelling positions of the operating gear. By interlocking the two step or speed controllers for the switching-in operations, and the synchronising, an increase in the number of transformer tappings has been avoided, and a quicker switching-off facility is furthermore obtained. The two locomotives are provided with electric couplings, so that one driver can operate the two locomotives by means of a so-called multiple control system.

The large express locomotive (1B+B1) of Brown Boverie and Company, has to satisfy the same conditions and to conform to the same specification as the locomotive just described, and is similar in its general arrangement. The driver's cabs are, however, right at the ends of the locomotives, and not as shown in Fig. 2.

A goods locomotive (C+C) of Brown Boverie and Company is shown in Fig. 3. This is a 3-axled bogie locomotive; each bogie is fitted with one motor pair situated between the second and third axle, transmitting their power by both shaft ends and spring gear wheels, and blind shaft with connecting rod, on to the driving rod system.

The driving arrangement is therefore similar to that of the first Loetschberg locomotive (No. 121), with the difference, however, that a motor-pair, instead of having one motor only, has been provided per bogie, the bogies having been interchanged. The tractive force of this locomotive is normally 16,000 kg., maximum 24,000 kg., the capacity being measured on the wheel, 2,050 B.H.P. The speed is 35 km. per hour normal, and 65 km. per hour maximum. The weight fixed by the Swiss Federal Railways will amount to approximately 112 tons, which fact induced the authorities to add trailing axles to the later locomotives.

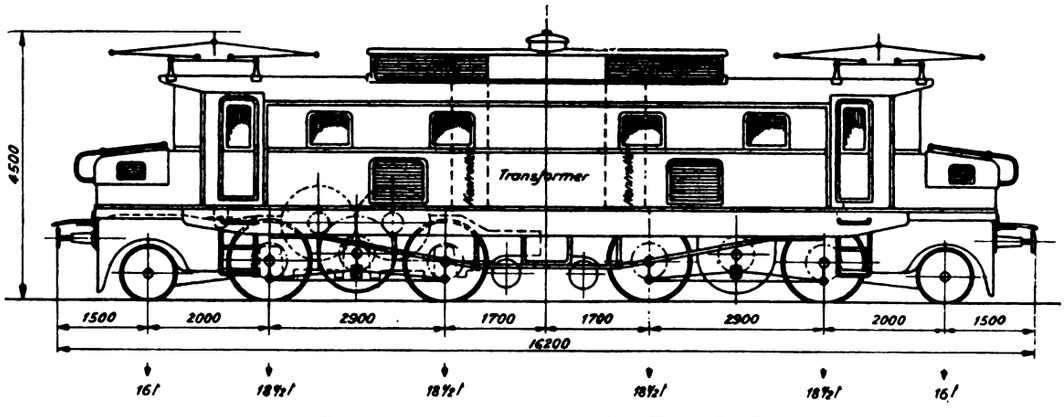


Fig 2.—Large Express Locomotive (Type 1B + B1).

The first order placed by the directorate of the Swiss Federal Railways for the Gotthard-Line electrification embraces 10 large express locomotives of the type illustrated in Fig. 3, which are being built by Brown Boverie and Company, Baden, as also 10 goods locomotives of the new type illustrated in Fig. 4, to be

Digitized by Google

constructed by the Ateliers de Construction Oerlikon and the Swiss Locomotive Works, Winterthur.

The general arrangement of this new locomotive type of the Ateliers de Construction Oerlikon, which can be built either as express locomotive or as goods locomotive, is of interest. When designing electric locomotives one can adopt—as has been the case with the Loetschberg locomotive—a complete double arrangement. This offers the possibility of avoiding a stoppage and, indeed, of maintaining if necessary a reduced service with half the equipment. This solution results in a somewhat longer locomotive and also longer wheel base and in a relatively heavy and expensive machine. It was justified on the Loetschberg Railway, for instance, where the design of a rather big locomotive had to be tackled to start with. Now, however, that the defects in the rolling stock of the Loetschberg Railway have become very rare indeed, one may avoid the duplication equipment. If, however, one single transformer has to suffice, the designer can usually do nothing better than to place it in the centre of the locomotive, and to make the latter of the bogie type. This makes a heavy locomotive frame conditional, as the main weight is situated in the centre; the consequential disadvantages are the result.

The investigations carried out by the Ateliers de Construction Oerlikon brought about the design of a locomotive type with the two bogies coupled directly with each other; the outer two-thirds of each bogie are fitted with the driving motors, and additional units which may be generally covered in by low hoods. The facilities for supervision and inspection of the large driving motors during the run may, after the excellent experience secured with commutator motors on the Loetschberg Railway, be dispensed with. On both sides of the hoods gantries are provided for the drivers. The actual locomotive case, or centre body, measures in length only one-third of the total locomotive length, and its stabilisation by a heavy framework is not any more necessary.

The centre locomotive case is carried at both ends by means of turning pins on the free inside thirds of the two bogies, and in the centre is the transformer and main switch. To both sides of the transformer, and built on to the latter, are the step-switches (for two-speed steps), so that the connections with the transformer tappings become extremely short. At the ends of the locomotive casing are the driver's cabs, on the roofs of which are mounted the current collectors. The transformer, as also the main switch-cover, form simultaneously a part of the locomotive case roof, so that the run of the high tension conductors is greatly simplified, and the unnecessary roof insulator-construction on the inside, as also a high tension room proper within the locomotive itself, is avoided.

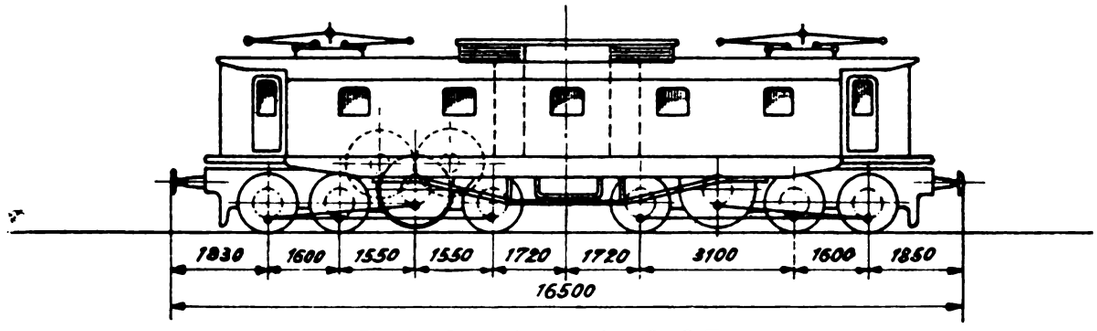


Fig. 3.—Goods Locomotive (C+C Type).

As the turning pins are in relatively close proximity, the locomotive main casing experiences very small side motions, and can therefore be built wider than would otherwise be the case, a factor of some importance for the general service. The turning pins are easily accessible, and the few flexible motor cables going over to the bogies can be very favourably suspended.

This arrangement carries with it the great advantage that the driver is not placed at one end of the locomotive, but while retaining a clear view ahead he has a certain feeling of safety, owing to the large part of the locomotive before him. The driver is also close to the switchgear, so that if, for one reason or another, he should not wish to make use of the multiple control, the service operations could be carried out by means of simple mechanical manipulations. For the depots and maintenance sheds the arrangement has furthermore the advantage that the motors and apparatus can be removed and re-erected much quicker, and also the advantage of the relatively shorter and lighter locomotive case.

The question of spare parts for these three sectionalised locomotives is also simplified. The locomotive weight is smaller, so that additional weight may be placed on the mechanical part, the driving wheels, rods, etc.

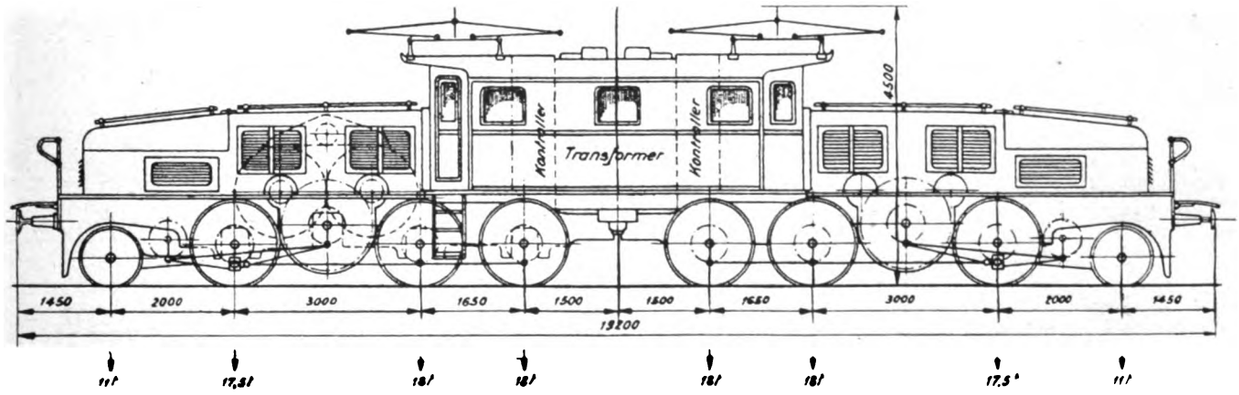


Fig. 4.—New Type of Electric Goods Locomotive with Slanting Connecting Rod Drive.

Digitized by Google

If the motor blind shafts cannot be arranged on a level with the driving shafts other driving solutions are possible, as, for instance, that adopted for the first Loetschberg locomotive (No. 121), and C+C trial

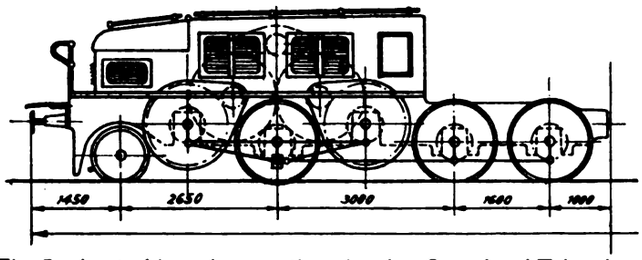


Fig. 5.—Loetschberg Locomotive, showing Crosshead Triangle.

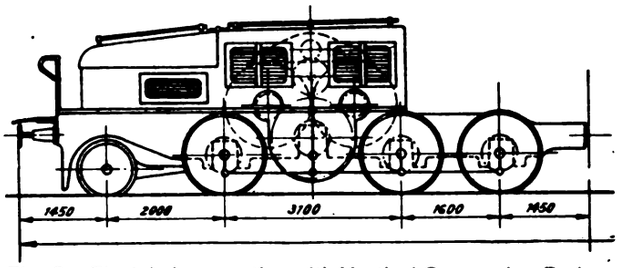


Fig. 6.—Electric Locomotive with Vertical Connecting Rods.

locomotive (Fig. 3), with slanting connecting rod, representing the lightest design, or by means of a crosshead triangle corresponding to the design of the large Loetschberg locomotive (Fig. 5). Another solution is illustrated by Fig. 6, where vertical connecting rods are requisitioned.

The proposition of the Locomotive Works, Winterthur, finally adopted, and centering in the slanting connecting rod drive with auxiliary shaft, as shown in Fig. 4, represents a design with considerable merit. maintaining the motors and the driving gear and rods, a duplication of the 600 and 800 B.H.P. locomotives is securable. Here, however, due to the space conditions appertaining, it is necessary to increase the height of the hood to that of the roof, which secures for the driver a better view of the track than on some locomotives.

ECONOMY OF COAL ESSENTIAL.

It is rather surprising to find the expert Committee which was appointed to consider the future of our coal mining industry advising that prosperity is dependent upon the free export of our coal. If this is the case, then it would seem advisable in the national interest

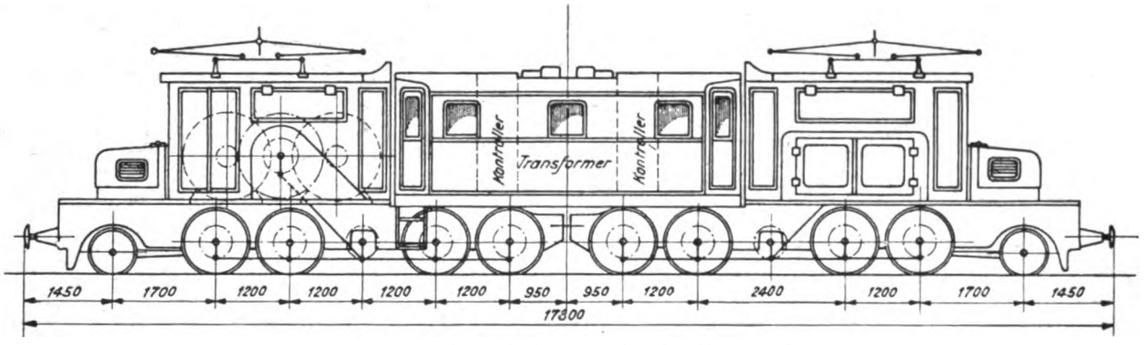


Fig. 8.—Treble Electric Locomotive for Narrow Gauge.

The speed ratio of the gears for these ten locomotives has been fixed at 1 : 4. The normal capacity of the four motors measured on the wheel is 2,100 B.H.P. The weight of the electric equipment is 58 tons, and that of the mechanical part 71 tons, giving a total weight of 129 tons, or 6·72 tons per metre, and a weight of adhesion of 107 tons.

Fig. 7 finally illustrates a type for smaller capacity,

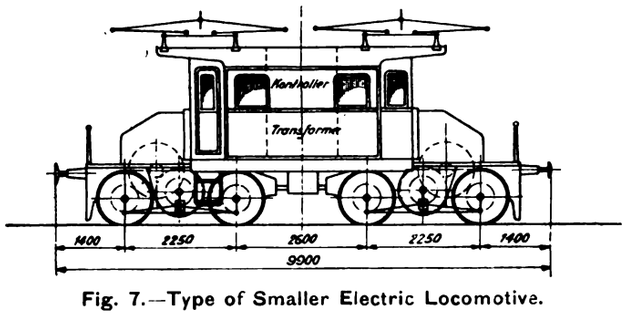


Fig. 7.—Type of Smaller Electric Locomotive.

for instance, 660 B.H.P. and a tractive force of 6,000 kg. (maximum 9,000 kg.) and 30 (maximum 45) km. per hour, which demonstrates that the system described above can also be utilised for auxiliary lines and suburban lines, as also for shunting locomotives. Fig. 8 shows further that the treble locomotive case design can be used for narrow gauge locomotives. For instance, on the Rhätische Railway, even when

rather that some compensation should be paid to those concerned in return for the refusal of free export, than that free export should be encouraged. Our coal supplies are not unlimited ; our industries are dependent upon their maintenance. The big scheme that has already been put forward for the establishment of a national system of electric power supply will save waste of coal but will encourage consumption. We recognise that to increase the output of the individual worker we must place at his disposal an increased amount of power. It is found that the greater the horse-power allocated to each worker the greater is the output of a factory per head in many properly organised industries. Coal is the only fuel with regard to which our position among the nations is really favourable. It would therefore appear to be most short-sighted to encourage a process of exhausting our supplies with unnecessary rapidity. Incidentally such a policy will affect our position as regards motor fuels in more ways than one. The proper treatment of coal also leads to the production of valuable liquid fuels of our own, and altogether it would appear to be a most foolhardy policy to dissipate our fuel supplies, which are at the best inadequate, in such a way as to assist foreign industries to compete successfully with our own as regards efficiency of individual output, and to render our transport permanently dependent in a very high degree upon the purchase of fuels controlled by foreign finance, and not to be produced in appreciable quantities within our own boundaries.

Digitized by Google

RAIL JOINTS AND CORRUGATIONS.

By H. M. DUDGEON
(Birmingham Corporation Tramways).

By the authorities on these subjects it is held that the coefficient of friction between steel rails and tires varies with the nature of the steel, the dry, wet, or greasy state of the rail, and with the speed of the wheel —the friction being greatest when the speed is least. If to this could be added that the coefficient varies with the vibration in the rail, it would appear to afford a very reasonable solution, not only of the vagaries of the " bump " at the rail joint but also of the mystery of rail corrugation.

That vibration is a prime factor in the destruction of tramway rails can be demonstrated by a study of the wear near the joints on any system where different methods of jointing have been tried. In Birmingham the writer is particularly fortunate in this respect, for here, owing to the narrow gauge and to the traffic density, the trouble at the joints has been very acute, and an energetic management has tried, at one time or another, almost every known device to cope with it. Owing to these different methods of jointing, the vibrations in the rails are interrupted in varying degrees, and the result is directly reflected in an extraordinary difference in the wear near the joints.

By a comparison of these different tramway, and also ordinary railway, joints, it will be found that the wear varies with the capacity of the joint to prevent the vibration in one rail being transmitted to the next. Where the ends of the rails are jointed firmly together, but can still vibrate together, there is no wear. Where the ends of rails are anchored rigidly to the concrete bed, and the vibration thus confined to one rail, there is very heavy wear, and between these two extremes of jointing may be found all states of wear.

That the heavy wear at the anchored joint is not due to any purely mechanical shortcoming is proved by the fact that it is much the strongest of any of the joints considered from the point of view of bearing stress applied in any direction. The flanges of the rails are joined by a length of heavy H girder and twelve ¾-in. bolts and nuts, and the webs by two heavy fish-plates and six 1-in. bolts. This girder sole-plate with its bolts and nuts is embedded in the concrete, and the running face of the rail before it leaves the platelayers' hands has any irregularity smoothed out with a file. On a route with a fast service of heavy cars the life history of such a joint is briefly this. In a few weeks bright and dull patches—the " rash " one might say of " corrugitis "—make their appearance at the leading ends of the rails ; in a few months these have developed into definite corrugations : at the end of about 12 months there is a distinct knock clearly perceptible to anyone listening to a passing car, and from this point onwards the destruction appears to develop at a rate something akin to geometrical progression.

" Working " and " concussion " are generally ascribed as the causes of this wear, and it is reasoned that, as a fished joint must eventually start working, it is better to anchor it, and thus save the displacement of the paving. The fact that the heavy sole plate must make the concussion worse is conceded, and its use is defended on the ground that between the two evils, the increase in the bump is the less. This might be good reasoning if it were based on sound premises, but unfortunately, I am afraid, it is not. That such a joint as this could work loose in the course of a few weeks is quite inconceivable. As the surface of the joint is filed true to a straight-edge to start with, concussion alone cannot account for the wear, otherwise a bump should develop over each of the heavy transverse anchors every 8 or 9 feet. Concussion, of course, must come into play directly the trouble has got a good start, and, with a 12-ton car dropping a sixteenth of an inch at each joint, working and looseness must come with it. But it is the root cause we want to get at—the germ of the disease.

The true cause will, I think, be found to be this. When the car is travelling on the first rail, it is on a structure in motion from a vibratory point of view by virtue of the vibration in the car itself ; but directly the leading wheels cross the joint on to the second rail, they find themselves on a structure at comparative rest. There is a difference in the adhesive force of the rails in these two states, and this difference at once reacts on the wheels causing them momentarily to bite better, then to slip. The cumulative effect is that long before the remainder of the rail is worn out, the leading end is hollowed out and hammered to the scrap heap. On the other hand, where the rails have been jointed in such a manner that the vibration is not interrupted at the joints, after years of heavy and fast service there is no more wear at or near the joints than there is at any other part of the rail, and indeed it is often very difficult to distinguish the joints at all. By " biting and slipping," I should like it to be understood, I do not imply that the wheels do anything in the nature of a spare revolution at each joint. It would express my meaning better, perhaps, if I were to say that the bite of the wheel varies, without mentioning anything about slipping. But biting and slipping is a very convenient expression, even if the extent of the slip is so small as to be almost immeasureable.

This theory of the cause of the wear at the joints is so far removed from conventional ideas that to most practical permanent way engineers it will appear grotesque. But remember it is based on some very hard facts, and I hope to show that it can be reasoned out without trespassing very far on the hypothetical. After all, it is generally by breaking away from convention that progress is made.

I have already mentioned that the bump at a joint such as that described starts with a bright and dull patch at the leading end of the rail, and anyone who has watched its development cannot help but discern the familiar corrugation. The only difference is that as time goes on the corrugation at the joint develops at a much more rapid rate than anywhere else. That these two troubles are due to the same cause, and that they are both amenable to the same treatment, I am quite certain. If it is reasoned that the wear at the joint is simply due to " working," then we have the paradoxical argument that the more rigid we make the joints, that is, the more we try to prevent the working, the worse the trouble gets. Besides, nowadays when economy is being preached on all hands it is as well, even as an author, to save ammunition and try to kill two birds with one stone.

My tip then for the double event, as nearly as possible as I can express it, would be this :—

(1) The adhesive force of the rail varies at different parts of the surface owing to the interruption and reflection of the vibration. Where this variation is very acute, and the momentum of the wheel is too great to allow the velocity to adjust itself to it, the surface of the rail is eroded unevenly and the result is corrugations.

(2) If a wheel rolling on a rail for any reason wanted to bite better or to slip, and it had any choice, it would do so at the points of least resistance. A variation in

Digitized by Google

the adhesive force of the rail, due to the interruption and reflection of the vibration in it, would set up such points and result in corrugations. Let us first see how these statements look from a class-room point of view, and afterwards see how they fit into actual practice.

That a difference exists between the coefficient of friction in a metal at rest and the same metal in a state of vibration may be an established fact, but so far as I can make out, none of the text books make mention of it. The nearest approach is where, in finding the coefficient between two pieces of metal by the angle of repose method, the text books are careful to explain that the table on which the experiment is carried out must be gently tapped to overcome the "static friction." If it is not tapped then the angle, and consequently the coefficient, is greater. This, I suggest, is exactly the same thing as saying that the coefficient is less when the metal is in a state of vibration, and anyone who cares can prove it for himself by carrying out the experiment, and instead of tapping the table, set the metal vibrating by any means. It will be found that the more violent the vibration, the smaller will become the angle of repose.

To appreciate in a general way how far any particular construction of tramway track interferes with the vibration of the rails is not difficult. But to try to elucidate just how much of the vibration is vertical, how much horizontal, and where any nodes and loops should be located, is quite a different thing, and happily so far as my argument is concerned, this is unnecessary. Where the ends of the rails are anchored firmly to the concrete bed it is quite evident that some interruption and reflection of the vibration must take place. Where the ends are not anchored and the fish-plates work loose, there must also be an interruption. Then again, where intermediate rigid anchors grip the rail, and where the paving is loose at one place and firm at another, the same thing must take place to a greater or less extent. For my purpose it is not necessary to assume that the reflection causes perfect nodes; these may be imperfect so long as their position remains constant.

If it is granted then that under certain conditions there is a variation in the adhesive force of the surface of the rail, the transition of this variation into corrugations might be reasoned thus. When a car is in motion at a uniform speed, with all the wheels biting perfectly, then according to the fundamental laws of kinetics all the forces at work are balanced, and their sum, if equated, would be zero. If we alter any one of these forces, that is if we make them unbalanced, the result is a change of speed and a positive or negative acceleration until equilibrium is restored. One of the most important of these forces is the friction between the wheels and the rail, and if we imagine a car travelling on a length of carefully sanded rail, and then coming to a length where, instead of sand, the rails have been liberally coated with yellow fat, it is obvious that if the tractive effort of the wheels and every other force concerned remained as before, there would be a very decided change in the speed. Let us consider then what takes place under more normal circumstances, for instance, where a car runs off a rail of good quality iron with a high coefficient of friction, on to a length of manganese steel with a comparatively low coefficient. Then for this law to stand good, either the speed must decrease or the tractive effort of the wheels increase, that is, in either case, there must be a certain amount of energy wasted. The only way that this wasted energy can be accounted for is in the wheels slipping and generating heat, and polishing the rail surface; the highly polished state of the surface of manganese steel rails appears to bear this out.

Let us imagine now a sort of compound rail built up of 3-in. lengths of iron and manganese steel alternately; what would be the result of a car running on such a structure? Obviously the momentum of the wheels could not adjust itself to such rapid changes, and the result could only be that the wheels would bite into the iron and roll or slip over the steel, and the ultimate result would be a series of perfect corrugations. If I have not already taken too many liberties with my reader's imagination, let us assume then that the difference in the biting force of the rail is brought about not by pieces of iron and steel, but is a function of the vibration of the rail, is there any reason why corrugation should not ensue? If a difference in the biting force can be established, I contend that something in the nature of corrugation must ensue, and the considerations that would govern the development of a good, bad, or indifferent crop would be these. (1) The coefficient of friction considered in the ordinary course between the tires and rails. (2) The rail joints, anchors and paving considered purely from the point of view of their capacity to interfere with the natural dissipation of the vibration in the rail. (3) The momentum of the wheels, and the weight of the cars.

Let us apply this theory now a little further to the rail joints, for at these points in contradistinction to any other portion of the rail we can form a very definite opinion of how the vibration is affected. The ordinary railway joint with its pair of fish-plates and four bolts, weighing together between 20 and 30 lb. is, I daresay, the envy of every tramway engineer. This joint must often feel proud of its robust health when it thinks of the troubles of its tramway confreres—the steel smelting plants, the cast iron cupolas, the electric and acetylene welding circuses, the rivetting hearths, the rail slotting, grinding and filing machines, and the endless array of patent fish plates, sole plates, lock nuts, and washers. Yet this simple railway joint stands up to the 100-ton locomotives with their trains of heavy coaches and 60 miles per hour speed, and is a perfect joint when the rail as a whole is worn out. "Flexibility of the track" is the usual explanation; yet when you come to think of it, there can be very little flexibility left at a joint when a 100-ton locomotive is over it. If the railway wheels wanted to act like the tramway wheels, that is, to be a grindstone, and grind out a hollow at the leading end of each rail, there would surely be enough rigidity for such a process. The secret of the joint will, I feel sure, be found in the foregoing reasoning, namely, that the flexibility of the joint transmits the vibration of the rail perfectly and there is no inducement for the wheel to bite better and grind out a hollow.

Take a tramway Thermit-welded joint; so long as this joint remains sound, it is quite impossible to distinguish it from the remainder of the rail—there is no bump or hollow of any kind. Where does its virtue spring from? Do you think it could be that it is specially kind to the rail vibrations?

Now let us take a tramway joint of a different construction. I can point out a route where—through no foresight or consideration for the vibration—the joints were made with fish-plates and sole-plates and 18 bolts, but owing to the sole-plates being flat and not embedded in the concrete, the ends of the rails could vibrate together. What is the result after 11 years of heavy and fast service? Practically none of the joints has ever been disturbed by a platelayer, and the ends of the rails are as good as the remaining 40 or 45 ft. This is surely a striking testimony to this theory.

If we apply this theory in a general way to tramway rail corrugation, it explains at once the will-o'-the-wisp nature of the trouble, as the development of the

Digitized by Google

corrugations would depend on so many varying factors. Any attempt to apply it to every aspect of tramway track would take up too much space, but I will apply it to one very puzzling aspect.

On most modern tramways, after relaying, there is generally found a brilliant crop of corrugations in the course of a few weeks or months, depending on the car service. Then the scrubbing car is requisitioned and by means of emery blocks and water scrubs them all out. At the end of a similar period of weeks or months it is usually found that in many places the corrugations have not reappeared at all ; at other places they are back, but in a much less virulent form, while at others, particularly at long-radiused curves, they are back in almost their original brilliance. This is rather a nasty state of things for many theorists, for it is evident that the mere scrubbing of the rail has not altered the side oscillation of the cars, or done away with the gearing or something equally miraculous. No ; what has happened is this. Dame Nature in the interval has come to the rescue. She did not like the vibration in the rails being maintained by reflection, so by means of the vibrations themselves she set about shaking the offending rigid points free, and the non-appearance and the altered appearance, of the corrugations, after the second cycle started, may be taken as a measure of her success. The persistence of the corrugations at the long-radiused curves is not difficult to account for. The speed of the cars on such curves is seldom or never less than when on the straight track, and the tendency for the wheels to slip, owing to the centrifugal force throwing an extra and unequal load on them, must always be greater than when on the straight. Besides, there is the difference in the radius of the outer and inner rails. If the rails then held out this special inducement for the slipping to take place at definite points the result in time would be corrugations.

Applied to railways the theory offers a very clear reason for their comparative freedom from the trouble. On the ordinary railway track, there are neither rigid joints, anchors, nor paving to interfere with or reflect the vibrations. The construction affords every facility for their natural dissipation, and when a wheel for any reason wants to bite better or to slip, the rails hold out no inducement for the bite or slip to take place at any particular points. At tunnels and deep cuttings* where, I understand, corrugations do occur, it would be necessary to take the acoustics of such places into consideration and to assume that the powerful sounds and echoes in some way interfere with the vibration in the rail. To anyone who understands acoustics, this will not appear a very alarming suggestion.

The " pitch-length " of corrugations may be some function of the diameter of the wheel or its momentum, and it is not necessary to imagine that at each individual corrugation of a series that a difference in the biting force of the rail is the original cause. If at any one point on the rail the difference in the biting force was very acute then it is reasonable to assume that a series of " bites and slips " or " bites and rolls " would take place until equilibrium was restored between the forward momentum and the rotary momentum of the wheel. As each slip burnished the surface of the rail and formed the crest of a corrugation the disease could thus spread, even if in the meantime the original cause no longer existed.

In conclusion I would mention that " rigidity " is generally ascribed as the root cause of all tramway track troubles, and that it is so, nobody, I am sure, would care to dispute. But rigidity is rather a loose term, and I hope I have shown to some extent just *why* rigidity counts.

* *Vide* THE TRAMWAY AND RAILWAY WORLD, March 9, 1911.

ELECTRIC POWER SUPPLY IN GERMANY.

The " Board of Trade Journal " of July 11 contains some information regarding proposals for the centralisation and development of electric power supply in Germany, which have received a good deal of attention there during the past two or three years. Reform of the present scheme has been urged on four grounds :—

(1) Economy in coal and its transport.

(2) The possibility of using a State monopoly of electricity and of coal as a source of revenue. (This has been opposed on the ground that the industrial necessity for cheap power would not allow the State to make much profit out of such a monopoly.)

(3) The importance of plentiful and cheap power in industrial reconstruction, especially in the development of the electro-chemical and electro-metallurgical industries.

(4) The necessity of exploiting all the water-power resources of the country.

For some time past the general trend of opinion has been in favour of increased State action. An article by Clemens Heiss in *Schmoller's Jahrbuch* for 1917 refers to the views of some of the principal electrical experts, and a treatise by H. Bueggeln, which appeared in the numbers for July and August, 1917, of *Technik und Wirtschaft*, contains further information.

As early as July, 1916, Dr. J. Klingenberg, in a speech at the War Conference of the Verband Deutscher Electro-Techniker, urged that the generation of electric current should be nationalised, while leaving the distribution and the retailing of power in the hands of existing undertakings. He opposed the distribution of current by the State on the grounds that that part of the electricity business, especially the extension of clientèle, required an adaptability to varying conditions which would be more likely to be found in the existing non-State bodies than in a Government department. He also contended that the State would be expected to extend uniform treatment to all users of current, whereas the best business interests required that there should be some scope for discrimination in rates. By confining its action to the generation of electricity the State would interfere as little as possible with existing rights, and it would create a desirable intermediary between itself and individual consumers.

Another expert, Dr. Voigt, also advocates centralisation. He, however, has been in favour of a short-distance scheme in place of Klingenberg's long-distance one. He thinks that the existing large works should be extended and inter-connected, and that the desired centralisation should be reached by gradual development.

Bueggeln believes that in spite of the usually unwieldy methods of State administration, a form could be created which could hold its own when compared with private concerns. He considers that power stations should be linked up, but believes that turbo-generators of 15,000 to 20,000 KW. are the most economical, and that there is no advantage in having larger units.

Professor Ballod, in one of a series of articles on " Finance after the War," which appeared in the *Europaische Staats und Wirtschafts Zeitung* in the Autumn of 1917, says that he is in favour of a State monopoly on grounds of fuel economy, as well as on financial grounds. He thinks that all the railways and all industrial and agricultural plant should be electrified, and that electricity should be produced in large plants of 100,000 KW. and distributed in high tension mains of 100,000 volts. He calculates that by electrifying the railways it would be possible to save at least one-third of the coal consumed by them, which amounted to about 20 million tons in the year immediately before the war. He urges that the State should endeavour to reduce home consumption of coal by one-third, and should reckon to make most of its profit on coal for export.

Digitized by Google

THE
Tramway and Railway World

FOUNDED IN 1892 AND PUBLISHED BY
THE TRAMWAY AND RAILWAY WORLD PUBLISHING COMPANY, LIMITED,
AMBERLEY HOUSE, NORFOLK STREET, LONDON, W.C.2

SUBSCRIPTION RATES

THE TRAMWAY AND RAILWAY WORLD can be obtained, post free, at the following rates:

FOR THE UNITED KINGDOM—Twenty-five Shillings per annum.
FOR ALL PLACES ABROAD—Thirty Shillings per annum.
Single Copies—One Shilling (Postage, 2 pence—Abroad, 5 pence).

THE ANNUAL SUBSCRIPTION INCLUDES 64 ISSUES, OF WHICH 12 ARE ILLUSTRATED NUMBERS.

In consequence of the restrictions on the use of paper, readers will be unable to obtain copies of THE TRAMWAY AND RAILWAY WORLD unless a definite order be given in advance. Those who order copies in this way from newsagents and experience any difficulty in obtaining them should communicate with us.

THE EDITORIAL AND PUBLISHING OFFICES OF
THE TRAMWAY AND RAILWAY WORLD
ARE AT AMBERLEY HOUSE, NORFOLK STREET,
LONDON, W.C.2

Telephone No.: GERRARD 2948.
Telegraphic Address: "TRAMIGRO, ESTRAND, LONDON."

LONDON, AUGUST 15, 1918.

Trade After the War.

At last the Government of the United Kingdom have taken the plunge. On July 24 Mr. Walter Long, Secretary of State for the Colonies, announced in a speech that the War Cabinet had approved of a scheme of preference within the Empire. Mr. Bonar Law, Chancellor of the Exchequer, in answer to questions in the House of Commons on July 29, stated that the Government had decided on the adoption of a policy of imperial preference after the war. Thus the Home Government have at last put themselves into line with the Governments of the Dominions. This country is actually going to have the same powers and rights as are enjoyed by practically every other country in the world. A clearly worked-out scheme is already in existence and has the approval of the Government, and the subject of preserving for the Empire raw materials produced within the Empire has a prominent place. Thus a great principle has been established. It clears the ground for the favourable consideration by the Government of the numerous recommendations by expert committees of their own appointment for fostering and promoting British trade and for preventing German competition and "peaceful penetration." There should be no more of the latter while human memory endures. We are promised a general election in the coming winter, but whatever may be the result of it, no one can imagine that the people of this country will send to represent them in the House of Commons men who would reverse the policy which is now being carefully, if slowly, developed. The Government are acting in concert with the Governments of the Dominions, and a fair prospect for the times to come is opening out. In the developments which may be expected, none offers a greater prospect than that associated with electrical industries. It has to be remembered that these industries suffered in two ways, while many of our other forms of activity suffered in only one. They suffered from destructive foreign competition under the system of free imports, and they were throttled by legislative action at home. As their repression has been so great, correspondingly great should be their rebound when all incubus has been removed.

Housing and Tramways.

A great deal is being said about the necessity of a great scheme of new housing for the country. In this direction as in others, people's minds have been enlarged during the war, and not only are arrears of house building to be made up, but the previously existing deficiency is to be removed. According to various statements some 300,000 houses are, with the aid of the State and of local authorities to be provided. This implies large additions to suburban areas, and possibly the formation of new small towns and villages. There are not to be more than twelve houses to the acre, so that the population may be spread out under healthy conditions. All this means that this population must be provided with transport facilities. If all the prophecies are fulfilled, the working classes are to continue to receive high wages and their standard of living is to be improved. That being so they will demand efficient means of transit along miles of roads where at present no facilities exist. But nothing has yet been done to meet this requirement. For many years the country has suffered under the paralysing influence of the Tramways Act of 1870—a measure wholly unsuited to the present

Digitized by Google

day. Private Bill procedure and even procedure under the Light Railways Act has been a constant hindrance to the promotion of new schemes. The Departmental Committee appointed by the Board of Trade to consider the position of the electrical trades after the war, in their recent report, had some very strong remarks on the Tramways Act, and particularly on the stifling effect of the purchase clause of that measure. They recommended a thorough reform of the legislation and conditions affecting the promotion, construction, and operation of tramways and light railways. As this proposal is only one of a number relating to electrical industries, and as it comes from such an influential quarter, there is some ground for hoping that a reform will be carried out. If facilities are not given for tramway and light railway extension there will be comparatively little hope for the great housing scheme. Long suburban and inter-urban lines are required, and it is obvious that for such purposes private enterprise must have freedom. Just as in the domain of electric power supply, we are outgrowing municipal limits, and large organisations covering wide areas are required. Safeguards for the public interest may be needed, it is true; but there is no difficulty in providing them. The difficulty is to avoid having too many or too stringent safeguards which in the past have prevented development. The new earth which the people are promised after the war will not be realised unless there is more freedom and encouragement to enterprise than there has been in the past. We believe that such incentives will be given, and that the electric tramway industry will as a consequence largely expand, and become a much greater factor in the development of the national resources than it was before the war.

Sheffield's Victory—Tramway Goods Service.

Strange indeed would it have been if the Sheffield Corporation had failed to gain the approval of the Local Legislation Committee of the House of Commons to their application for powers to use the tramways for the conveyance of goods and parcels. Although there are many Tramways Acts conferring sanction for the conveyance of goods, minerals, and parcels, powerful opposition was invoked against the Sheffield Bill, which also includes the conveyance of animals. In addition to the objections raised to the whole scheme by the Great Central Railway Company, opposition almost as strong was offered by the National Union of Horse and Vehicle Owners and the local Horse and Motor Owners' Association, who also asked for the insertion of protective clauses. Unfortunately for the opposition, the circumstances of the present day belie their assertions that they are capable of providing all the facilities required. In this connection the local Chamber of Commerce brought their views before the Commons Committee. The Chamber favoured the exercise of the powers sought within the city limits, but outside of that area they limited their approval to the carriage of tradesmen's parcels. Such a restriction, however, would be contrary to the spirit of the day, as expressed recently by the Board of Trade Committee on Electric Power Supply. That Committee's report referred to the present system under which electricity is supplied by a large number of small areas as being the result of a policy adopted at a time when electrical engineering was in its infancy. Besides, in all the discussions on the subject of goods carriage, emphasis has been laid upon the need for inter-running, and where that desideratum cannot be achieved upon rails the provision of road vehicles has been insisted upon. Sheffield seeks to provide such facilities by taking power to employ any kind of road vehicles necessary to carry on a receiving and forwarding business. It is satisfactory that the Committee granted the powers asked for and also approved of the charges to be made. While it is not to be expected that the Corporation will be able to do much to put their powers into effect during the war, particularly as regards the provision of special rolling stock, there is no reason why they should not be granted priority certificates to enable them to obtain road motor vehicles. Possibly something might also be done in the direction of constructing sidings to works and warehouses, though it would be impossible to provide the proposed junctions with neighbouring light railway and tramway systems. Now that the Sheffield scheme has been sanctioned, no time should be lost by other authorities in formulating plans

Digitized by Google

either for carrying out as soon as possible the goods haulage powers that they may possess or in taking steps to secure what should now become known as the Sheffie'd clauses. The necessity of doing everything possible to augment the transport facilities during the present crisis is shewn by the fact that the Road Transport Committee of the Board of Trade have requested tramway authorities to consider the steps they can take, either by day or night, with a view to saving horse haulage and petrol. Bradford Tramways Committee, for one, are considering what use can be made of their lines at night. The authorities must not forget that the Board's request for a return comes as a mandate, for the Transport Committee's terms of reference included electrically-propelled vehicles. It is likely that when the returns have been digested, orders will be issued to tramway authorities, though it is advisable that before this is done there should be collaboration with the experts of the Board of Trade Tramways Committee. Already all other road vehicles carrying loads above 15 cwt. have had to be registered and licensed with the police. The sequel to this step was seen in the issue on July 31 of a Defence of the Realm Regulation, which controls the collection and delivery of goods, the area of collection, and the number of collections and deliveries.

Car Crews to Aid Economy.

More efficient service by motormen and conductors is to be welcomed, especially if it assists managers to do more than comply with the Board of Trade order to effect a 15 per cent. reduction in coal at the generating station. All undertakings are not so favourably situated as the London County Council and some other undertakings for obtaining coke breeze and other economical substitutes to secure the reduction in the consumption of energy without curtailing the services. Every authority, however, should encourage their employees to operate the cars in such a manner that not only will energy be saved, but the employers will secure other benefits. The latter have been enumerated to the London County Council by Mr. A. L. C. Fell as comprising less wear and tear in car equipment and plant generally, reduced loading of the cables (many at present being over-loaded), a d a reduction of the peak load at the generating and sub-stations. After consultation with the employees, a bonus has been offered to County Council motormen and conductors for economy of current, the payment to be equal to 50 per cent. of the value of the direct saving of fuel, calculated on the average number of units used per car mile during the year 1917-18. The amount then was 2·27 units, measured at the bus-bars in sub-stations. It is anticipated that with a saving of energy of 10 per cent., at the present average price of fuel, there would be a fall of about £6,350 in the cost of coal per quarter. Fifty per cent. of that saving distributed equally to drivers and conductors would represent a sum of about 12s. 5d. per quarter a head. The results obtained in various towns with car meters for years past stamp this estimate as being easily fulfilled. The only difficulty, we imagine, will be that with many motormen less thoroughly trained than was the case prior to the war, there will be a need for refresher classes. It will be easier to secure the desired object, both with the old hands and with the novices who are now coming forward in greater numbers as drivers, if the instruction is introduced as part of the efforts needed to help win the war. That purpose is what the call for economy amounts to, and it will be a stimulus to remind car crews that their goodwill can do something to make up for the reduced coal output entailed by the Army's call upon the miners. Managers in the United States have for a year past given attention to fuel economy, and one of them, Mr. W. Arthur, of New Haven, Connecticut, has written a handbook on efficient car operation for distribution among the platform men. A more effective exhortation we have never read than the four pages of extracts that were published in the May issue of the Journal of the Tramways and Light Railways Association. Though mainly concerned with the motorman, the handbook contains a few rules for the conductor also, and shows that co-operation between the two will enable coal consumption per car mile to be kept down to about 6 lb., whereas a careless driver may cause twice as much to be consumed.

Municipal Tramway Association Conference.—The annual meeting will be held at Leicester on Thursday and Friday, September 26 and 27, under the presidency of Alderman S. Flint, J.P., chairman of the Leicester Corporation Tramways Committee.

Digitized by Google

Tramways and Light Railways Association

Tenth Annual Congress, held in London, July 12, 1918.

PRESENT POSITION OF THE TRAMWAY INDUSTRY—NATIONAL AWARDS TO EMPLOYEES. NATIONAL INDUSTRIAL COUNCILS AS APPLIED TO TRAMWAYS. INCREASED FARES—THE COAL RESTRICTION ORDER.

The twenty-first annual meeting of the Tramways and Light Railways Association was held at Caxton Hall, Westminster, on July 12. Pending the arrival of the president, the Rt. Hon. Viscount Chilston, and in the absence through illness of the chairman of the council, the Hon. Sir Arthur Stanley, G.B.E., M.P., the chair was taken by Mr. R. J. Howley, the vice-chairman.

Mr. Howley said he knew that the announcement he had to make would be a very great disappointment to everyone, namely, that the chairman of the council, Sir Arthur Stanley, had been taken ill with influenza the previous evening, and that day was confined to bed. The Secretary had seen Sir Arthur, and found that everything had been prepared for that meeting, so that they would be able to hear his own words.

The Secretary (Mr. A. de Turckheim), after reading the formal notice convening the meeting, together with the certificate of the auditor, read the address of the chairman of the council, which was as follows :—

SIR ARTHUR STANLEY'S ADDRESS.

The accounts for the year 1917 were circulated in our January journal. The annual meeting in pre-war days was usually held early in the year, but owing to the war we are following last year's precedent, and are combining the annual meeting with the annual congress and dinner. The revenue for 1917 amounted to £720 from subscriptions, and £28 from interest on deposits and war loans, as against £730 and £25 respectively for last year. The expenses amounted to £662, as against £647 last year. After writing off 15 guineas on subscription account, allowing 10 per cent. for depreciation of furniture, and £14 for income-tax, under the new arrangement, there remains a net credit balance of £87 to carry forward, which, added to balances brought forward from previous years, gives us a total balance of £608 to carry forward; £550 of this is invested in War Bonds. There are no liabilities. Before the resolution approving the accounts is put, you will wish me to say a few words with regard to the work done by our Association during the year.

Tramways (Board of Trade) Committee.

The outstanding event was the setting up by the Board of Trade of the "Tramways (Board of Trade) Committee." I think we have ample grounds for congratulation in the fact that out past vice-chairman, Mr. James Devonshire, was appointed chairman of that committee by the President of the Board of Trade. Everyone who knows Mr. Devonshire will agree that no better choice could have been made. We were invited to appoint two representatives from this Association on the committee, and your council unanimously invited Mr. Stephen Sellon, one of our vice-presidents, and Mr. Howley, our very active vice-chairman, to represent us. I am glad to say they both agreed to serve, and they are both giving a great deal of their valuable time to the strenuous and anxious work required to be done.

The setting up of this committee was urgently needed, as a great variety of questions had to be dealt with, covering the whole field of tramway work, and whereas previously applications had to be made to numerous widely-scattered Government departments, the new system evolved order out of chaos, and at least we know where to go, to whom to apply, and what procedure to follow. It was a serious task to undertake, and sincere thanks are due to our two members for having consented to undertake it. Naturally we do not all get all we want, but I think we should realise the difficulties which prevailing conditions have created, and which the committee have to contend with.

National Awards.

The increased cost of living brought on by the war led to a perfect epidemic of demands for increased wages on the part of our employees. At first these were spasmodic, but as time went on they became universal. At first the demands were put forward locally in accordance, more or less, with local conditions. Later on it became apparent that want of uniformity in granting bonuses, etc., led to incongruities and inconsistencies, and matters were further complicated by the fact that other allied industries, and especially munition works all over the country, increased their rates of payment, with the result that classes of men working in close touch with and near to other classes of men felt that they were not benefitting to the same extent as their neighbours. Great unrest resulted, and the Committee on Production, set up to deal with these questions as they arose, made large numbers of awards, almost from week to week, as they were bound to do, until the whole question became hopelessly confused and complicated. The men's unions realised the difficulty, and for the first time in the history of tramways a demand was put forward by them for a national award, which should include or consolidate all bonuses previously granted. This was the demand for a 20s. bonus, and it was addressed to the two Tramway Associations, as representing between them practically every tramway undertaking in the United Kingdom. The difficulty we were then faced with arose from the fact that under our existing constitution we are not a trade union, and cannot bind our members on any question of wages, etc. We got over the difficulty by calling a special meeting of our company-owned undertakings, our municipal members taking what action they thought best through the Municipal Tramways Association. The result of these special meetings was that a committee was formed with powers to represent the companies before the Committee on Production. The arbitration took place on March 8 last, and an all-round war bonus of 20s. was granted to tramway employees, thus bringing them all into line. Obviously, an all-round standard payment must bear more heavily upon smaller outlying undertakings, and some objections were heard. It is open to those members who do not wish to be interfered with to notify their desire to be excluded from the arbitration, as no compulsion whatever rests upon them as members of the association; but it is questionable in these days of highly organised labour whether any permanent benefit would accrue to them for such exclusion.

Quite recently we received a further demand on a national basis for a 12½ per cent. increase or its equivalent, and for a revision of the earlier award to provide equal payment for women as for men, both as regards war wages and basic rates. Due notice thereof was given by us to all our company members, and they practically all agreed to leave it to us to represent them at the arbitration. This took place on July 3, with the result that the award of July 9, now before you, was made. This award increases the 20s. bonus to 25s. per week, and is in full settlement of any claim with respect to the bonus of 12½ per cent. The claim for equal bonus to women fails. Before saying anything further I am sure I shall be voicing your wishes if I express to Mr. Howley our appreciation of the very able way in which he put our case at both arbitrations. In spite of all the other claims upon his time, he agreed to be our spokesman on these two occasions, as well as before the Select Committee dealing with the question of "Increase of Fares." It entailed a great amount of work, and I do not think he missed a single point in his arguments on our behalf.

Increase of Fares.

Well, it is obvious that you cannot go on indefinitely paying out more and more money without feeling the strain. Indeed, the position of many of the smaller undertakings was, or is, becoming increasingly precarious, and as far back as 1916 we took steps with a view to obtaining relief by pressing for powers to increase fares. Nothing was done, however, in spite of all our efforts, until in April last a Select Committee of the House of Commons was appointed by the President of the Board of Trade to go into the matter. Exhaustive evidence was given by both Tramway Associations, and when the Select Committee issued their report on June 7 we had some excuse for hoping that at any rate a measure of relief would be forthcoming before very long. I greatly fear that those hopes were somewhat premature. Instead of a short Government measure dealing with tramways, which could have gone through quickly, and thus enabled some of the hardly-hit concerns to take advantage of the summer months to recoup themselves to some slight extent, we are now faced with a controversial Bill dealing with gas, water, electricity, and tramways, the provisions of which, as they stand, are inapplicable to tramways generally. This is a severe disappointment to us, but we must continue our efforts with a view to amending the Bill so as to secure what benefit we can for our members.

Industrial Councils.

I understand that this question will be discussed further this afternoon, and I only wish to say that when the Whitley Report

Digitized by Google

was issued we were among the first to consider the matter. You will doubtless hear how, in conjunction with our municipal friends, we have had a number of conferences with the men's unions and representatives of the Ministry of Labour. I believe that I may say that a draft scheme for setting up a National Council for Tramways is all but completed, and will be submitted for your approval before long. Any attempt to bring into closer co-operation the representatives of the employers and employed for their mutual benefit and for that of the great general public should be encouraged, and if it is to lead to a better understanding of each other and to more harmonious working in the future, no efforts on our part will be spared to bring this about. I have only touched on a few of the more important matters which your council and our various committees have been dealing with. In addition to these we have been busy with the following subjects:—Decimal coinage (especially in its application to tramways), standardisation of overhead line material, national service, deferred repairs and statutory depreciation allowances, women drivers, steel tires, etc. In the near future we shall be devoting some attention to the supply of tramway materials after the war, the Board of Trade Committee Report on electric power supply, which contains clauses dealing with tramway generating stations, and many other matters.

The accounts and balance sheet for the year ended December 31, 1917, having been unanimously adopted,

The Secretary read a note from Sir Arthur Stanley expressing sincere thanks to the retiring members of the council, Messrs. James Devonshire, W. G. Verdon Smith, C. D. Stanley, J. B. Tippetts, E. Hatton, and W. T. Robson. He understood that Mr. Robson had had a serious illness, and they all hoped that he might soon be completely restored to health.

The Chairman proposed six gentlemen who had been nominated by the council to fill the vacancies created by the retiring members. It had, he said, been rather difficult this year to maintain the balance of representation as between their municipal friends and their company friends on the council, because there were certain claims, if he might say so, owing to services rendered, which they wished to recognise. Therefore it was with pleasure that he proposed the election of Messrs. S. E. Baker, A. L. Barber, F. Coutts, E. H. Edwardes, H. England, and H. L. White.

Mr. Stephen Sellon formally seconded the motion.

Councillor R. Mayne, as representing a municipal corporation, asked how many on the Council of the Association were members or representatives of municipal corporations, and how many would be the total if the chairman's proposal was carried.

The Chairman replied that there would be three representatives of corporations out of eighteen, viz., Messrs. I. Bulfin, T. B. Goodyer, and G. W. Holford.

Mr. E. Hatton asked if this was a proper representation of the various sections of their Association, viz., municipalities and large and small private companies. They did not know whether any issues would shortly be joined between municipalities and companies, but if the former were not properly represented on the council, did they think that it would add to the smooth working of negotiations between those bodies? He moved an amendment to leave out one name and to substitute that of Councillor Mayne, of Newcastle.

Mr. A. L. C. Fell said that if anything could be done to cement the good feeling that had been brought about during the last few years he thought it would be a very good thing. During the last few years there had been a most intimate co-operation between the two sides of the Association, and it would be a great pity if it were felt that the organisation were gradually drifting into a purely company association. He therefore hoped that the council would see their way to put a few more municipal representatives on the council, so that the Association might represent more or less the tramway industry as a whole.

Councillor R. Mayne suggested that the Association was something like the Siamese twins. The connection between the two branches had grown up gradually, and it would be unfortunate if at this moment any differences should arise. He was still as positive as ever in his belief that they should maintain the connection, and if possible improve and strengthen it. Mr. Fell took the same view apparently, and it would be an immense advantage in keeping up the connection if he would serve, and, with Mr. Fell's permission, he wished to nominate him as a member of the council.

Mr. Hatton, in seconding the nomination of Mr. Fell, explained that in rising to speak as he had done he had intended nothing personal. He was simply considering the constitution of the Association. He would therefore second Mr. Fell's nomination with much pleasure, and he would also add the name of Mr. L. E. Harvey, of Ilford.

The Chairman replied that in order to meet the wishes of several speakers the council would accept the proposal that the names be put separately, and that a ballot should be taken.

Messrs. Hatton and Mason were appointed scrutineers, and the following gentlemen were subsequently declared to have been chosen as members of the council:—Mr. H. England, Mr. E. H. Edwardes, Mr. A. L. C. Fell, Major F. Coutts, Councillor R. Mayne, and Mr. S. E. Baker.

Colonel A. W. Chambers, the retiring auditor, was unanimously reappointed for the ensuing year, and received the thanks of the Association for his services.

The Chairman said he thought that it was a very healthy sign in one way that they should have had a vote on the reconstruction of the council, and he thought it would be a desirable plan if they could vote in a similar way at each annual meeting. He proposed to put the matter before the council for consideration.

This completed the business of the annual meeting, which was followed immediately by the annual congress.

THE ANNUAL CONGRESS.

NATIONAL AWARDS.

THE 20s. BONUS AND 12½ PER CENT. ADVANCE.

The Chairman (Mr. R. J. Howley) said they proposed to discuss as far as time would allow four subjects, namely, National Awards (the 20s. bonus and 12½ per cent. advance), National Industrial Councils, Increased Fares, and the Coal Restriction Order. On the first question of wages and national awards, he had been asked by the Secretary to say a few words. As they had heard in the address from Sir Arthur Stanley, the Association was faced with some difficulty in dealing with the question of wages and awards, for the reason that as the Association was not allowed to act as a trade union they were debarred from dealing with the question of wages. Therefore it was necessary, when the national demand for 20s. was under consideration last March, to call a conference. They called a conference of all company-owned undertakings (a similar conference had been called by the municipalities with regard to their interests), and they had to get the approval of that conference to their taking part in the meeting before Sir George Askwith, and subsequently in the arbitration which took place before the Committee on Production. At that time a small committee was appointed to deal with these matters, and that committee had been dealing with them since, and had dealt with the question of the application of a 12½ per cent. further bonus and with the demand that women should be paid the same war bonus and wages as men. In some few instances they had criticism as to the necessity of dealing with these questions of wages on a national basis; up to the end of last year they were generally dealt with by each undertaking separately. But early this year the two Tramway Associations negotiated with the National Transport Workers' Federation, which undertook to represent the whole of the tramway workers of the country, and they had the national claim for 20s. a week as the main plank of their platform. Well, the men's side having come together, and having put forward their claim on a national basis, it would have been very regrettable, he thought, if the employers' side had not met them in combination also to discuss the matter from the point of view of its applicability generally throughout the industry. He did not wish them to think that it necessarily followed that the same basic rate of wages would have to be paid in every district throughout the country, because these national questions were being dealt with by the whole industry, by representatives of the employers on the one side and by the National Transport Workers' Federation on the other. He thought that different basic rates of wages paid in different localities must follow, and later, when the question of wages and basic rates of wages, rather than war wages and war bonus, came to be dealt with, there would have to be some form of local association competent to deal in each locality with the wages questions which arose in that particular locality. That, he thought, was one of the objects which would be attained later on, when the Whitley Report was put into effect, and they had National Industrial Councils dealing with national questions and national awards. District councils would then no doubt deal with local affairs in each district, and would take into consideration the difference between the basic rates in one area and in another. In connection with the company-owned side of the Association, he thought a standing conference would have to be appointed representing the companies, and it was suggested that the difficulty of not being able to represent the companies directly on questions of wages might be got over by this standing conference, which would appoint the Association as its secretary. It might also appoint as an emergency committee the members of the council who represented the privately-owned tramways. In that way there would be legally two different bodies, that is to say, the Tramways and Light Railways Association, who could not deal with wages, and a Conference of tramway owners formed practically into an Employers' Federation. By appointing the Association as secretary and certain members of the proposed council as an emergency committee, they would get joint consideration of the matter and the speedy settlement and discussion which he thought would be effective, and would meet the conditions. On the municipal side, there would be a somewhat similar body, as he understood that they were in exactly the same difficulty in regard to the constitution of that Association. Up to January last the number of applications was as a rule small, and had not been coming forward very rapidly. He thought 6s. 6d. was about a fair

Digitized by Google

average for war bonus at the end of 1916, and it had risen at the end of 1917 to about 12s. throughout the country. Then, as they knew, in March, 1918, it jumped up to 20s., and then a few months afterwards they got the application for 12½ per cent. It was interesting to note that application for 12½ per cent. was made on behalf of certainly one union quite early in the year—about the time the arbitration for the 20s. took place. At that arbitration the question was raised as to whether the men were going to continue to come forward every few weeks demanding a further increase, and also whether individual unions were going to press for increases while the employers' representatives were negotiating with the National Transport Workers' Federation. Although no definite statement was made, it was generally said by the other side that they proposed to claim a revision of the award at intervals of four months; he thought that was the period in the engineering trade in which awards came up for revision. Mr. Hamilton, who was the representative of the Municipal Association, and himself got into touch through Sir George Askwith with Mr. Williams, and they put it to him that they did not consider that was carrying out in a fair way the undertaking that they should recognise the National Transport Workers' Federation as the body which embraced the employees; and they asked that the demands by individual unions on individual undertakings should cease. Mr. Williams met them in a very fair way, and he got this application withdrawn at the time, but he stated that no doubt they would hear more about it at a later stage in the form of a national demand, and, as they knew, it resulted in the further arbitration which was considered a short time ago by the Committee on Production, whose award was issued the previous day.

The award referred to various matters, and after the introductory part it provided (Mr. Howley then proceeded to read clauses 5 to 14 of the award of July 9, 1918). The award was signed by William W. Mackenzie, John M. Denny, John Barker, and countersigned by H. J. Wilson, secretary.

He thought that it was satisfactory in a sense. They felt that 5s. was the figure which would be given in the case of the men, following on the decision in the case of the Master Carmen's Association in London, which also went before the Committee on Production. In the case of the women, they could feel that at any rate there was no need to pay further war bonuses to the women employed in the tramway industry, where they were getting very excellent wages or remuneration for their services as compared with any other class of work in which they might be engaged. He hoped that these few remarks might encourage discussion, and that the members would give their views.

Mr. A. L. Barber (secretary, Metropolitan Electric Tramways) said that there was one point in the award about which he should like to hear a word. There was no reference to clerks. He remembered that both the Chairman and Mr. McElroy, who represented the Municipal Tramways Association, distinctly dealt with the question of clerks at the hearing, and he understood that this award did not apply to clerks. Would the chairman say whether or not that were so?

The Chairman.—The award applies to the two parties who appeared before the Committee on Production. If the clerks belong to a union which is affiliated to the National Transport Workers' Federation, you will probably find that they claim that the award is applicable to them, but I think that in very few cases do they belong to that union.

Mr. Ernest Hatton (general manager, Newcastle Corporation Tramways) asked if the committee had under consideration or would they take into consideration the question of wages in the tramway industry after the war. He thought that was the most important thing that tramway people would have to consider. He was of the opinion that if the wages of tramway men could be dealt with in the same way that the wages of miners and steel workers are dealt with, that is, having a basic wage, and that according to the prosperity or otherwise of the industry in the area or of the undertaking their basic wage would rise or fall, it would be advantageous because it gave them an interest in the work they had in hand. He knew there were difficulties in dealing with the proposition, but he did not think those difficulties insurmountable. He did not know whether the Association had dealt with that point or considered it, but he thought that it was a thing they should consider. The other point was in connection with coal. At the present time they were directed by the orders of the Coal Controller as to what price they paid for coal, but of course the people who supplied them would rather be without the tramway consumption, because if the dealers could get ships in port they could get two or three times the amount of money per ton that they could sell coal for to tramways.

The Chairman remarked that the conference was going to discuss the Coal Restriction Order later on when the point could be raised.

Mr. J. R. D. Cox (general manager, Edinburgh and District Tramways Company) thought the most serious point of the whole thing was that they had no guarantee that there would not be another demand. In fact, it was practically certain that there would be. The National Transport Workers' Federation represented many unions and very small sections of workers, like the porters, who made demands locally and got them. Was there any guarantee from the Federation that they would not allow their members in isolated unions to make demands, and that they could speak for the whole of their members and the unions they represented, because if that was not established, he was perfectly certain they would have these constant demands for increases until they would not be able to pay their way. His own company had an arrangement with the workers at the beginning of the year, things went forward satisfactorily, and their employees did not make fresh demands or actively associate themselves with this national movement, but naturally they came into the award. He was quite sure that unless they got a guarantee from the Federation that they would represent all these unions, they would be up against this sort of trouble again in a few months' time.

Councillor R. Mayne (chairman, Newcastle Corporation Tramway Committee) thought there was a good deal to be said on the subject raised by Mr. Cox. Now that they had come to deal with these matters in a national form, it would be wise for tramway undertakers to be very careful as to awards locally, and they should hesitate to act separately. He believed that an agreement was being discussed with the National Transport Workers' Federation as to whether they would not take up these matters that were raised locally, so that they should not in their separate localities create precedents. Municipal owners had been prejudiced on several occasions by the action of company owners who had given readily what neighbouring concerns could not afford, and they—the municipal owners—had had to give it in consequence. They should be very careful not to prejudice the general position by any action they might take locally. He did not know whether any agreement had been discussed between the National Transport Workers' Federation and the Executive of that Association, but he thought that it was very important that there should be an understanding. These things could not be done both ways. They could not as individual companies or corporations deal with matters, and then have them dealt with nationally as well. It must be one policy or the other, and they must try to work to that end.

Mr. H. L. White (manager and engineer, Great Grimsby Tramways Company) desired to point out that company representatives were complaining of the municipal corporation representatives. In the matter of the 12½ per cent., for instance, companies had been very much handicapped by one particular municipal concern in the Midlands. Therefore many of the company representatives felt that, although for some time past they had been endeavouring to co-ordinate action, there was very little chance of its being successful in the long run. Of course it was much to be desired that in the matter of wages there should be unified action, but speaking for himself and many friends of the Association who could not be there, and speaking for those who were connected with the same companies as himself, they had always felt that their action would have been very much better represented if they could have dealt with these matters separately rather than have been influenced in any way by municipal action.

Mr. A. L. C. Fell (general manager, London County Council Tramsays) thought that Mr. White was rather unfair. As a matter of fact, the whole of the municipal representatives were let down just as much by the action of that one municipal authority as the companies. It seemed to him that if they would only carry out loyally the action they had taken, that of having a joint conference between the two sections—on the one hand, the conference of the municipalities, and on the other hand the conference of the companies—they could take combined action. He thought that if some of these people had not broken away the thing would have been absolutely on the right footing. He did not know how they were going to protect themselves against that, unless every municipality agreed to go to the municipal conference and every company agreed to go to the tramway conference. If they could get that undertaking, then they had got the idea.

Mr. White remarked that it might not have been intentional, but the companies were sold.

Councillor Mayne said they did not want the companies to be sold; but the thing happened both ways, and the principle was the same.

Mr. C. D. Stanley (engineer and manager, New St. Helens and District Tramways Company) asked if it were not a fact that every member of the Association had been requested not to deal locally with these matters. It did not matter to-day whether the undertaking was a company or a corporation, but what was wanted was compliance with the Association's request.

The Chairman said he would deal with the last matter first. Not only their Association, but, from what he had been told, the Municipal Tramways Association also, regarded it as very important that none should make individual bargains on matters which were likely to become national questions. They had to recognise that their municipal friends worked under more difficult conditions than they did, because they had unfortunately many different classes of employees, who sometimes claimed to be treated on the same basis all round. The matter had not been lost sight of, however, and the other day, after the arbitration at the Committee on Production, an interview took place between Mr. Williams, the secretary of the National Transport Workers' Federation, and their representatives on this very point. Mr. Williams undertook to look

Digitized by Google

into every case that they brought to his notice, in which local claims were made which to some extent were antagonistic to a national settlement. So far he must say that Mr. Williams, as secretary of the Federation, had in every case they had submitted to him, in which there was a dispute as to the interpretation of a national award, or matters of that sort, taken action at once with a view to restraining his people and pointing out that they should abide by decisions arrived at between his Federation and those of the employers. He thought this was one of the benefits they got by dealing with some of these questions on a national basis rather than locally. There was no doubt that if matters were dealt with locally, pressure would first be brought to bear on what he might call certain squeezeable people with unfortunate results. It did happen, as a matter of fact, in the case of the 12½ per cent. advance, as they all knew, to the prejudice of the whole industry. A good deal had been done since in the way of organisation on the employers' side, and similar cases should not occur again. He thought that answered Mr. Cox's point. If they would refer any questions to them when they received a local demand which was in any way in conflict with the national settlement, they would take it up with the Federation and deal with it. With regard to the question raised by Mr. Hatton of dealing with wages after the war, that was a very serious matter, and in addressing the Committee on Production the other day, he warned them that this was practically the first case where men did not claim further remuneration on the plea of cost of living. Their argument was that others engaged in similar occupation were getting the 12½ per cent., and therefore they were entitled to it. He pointed out to the committee the danger of going ahead on those lines, and the trouble that was going to arise after the war when they went back to more normal conditions. They were aware of the restriction of railway services, and increased railway fares had no doubt benefitted tramways to a considerable extent, but they would find that after the war there would not only be an agitation in regard to the 50 per cent. increase in fares, but that in time the railway companies would restore their local train services, and though a good many passengers, having tasted the sweets of tramway travelling, would stick to the tramways, yet a good many of them would return to railway travelling, and then they would be faced with a reduced revenue, and the difficulty would then be to get wages adjusted. He did not think they would ever go back to where they were, but a good many undertakings would find it very difficult immediately after the war to make both ends meet.

NATIONAL INDUSTRIAL COUNCILS.

Mr. E. H. Edwardes (general manager and engineer, Lancashire United Tramways), in complying with a request to open the discussion on National Industrial Councils, said that at the conference last year he opened a very similar discussion on standard conditions of labour and rates of pay. At that time there was a discussion and there was a good deal of difference of opinion among members. Since then progress had been made by the adoption of the Whitley Report, which, as they were aware, had received the approval of Parliament and of the Ministry of Labour. There had been a number of papers printed from time to time by the Whitley Committee pointing out the usefulness of National Councils, as set out in the Whitley Report, and making many suggestions as to the best means or the best system of setting up National Councils. The council of their Association started this work almost immediately. He believed they were one of the first industries to start the formation of these National Councils. On account of the complications existing in their industry owing to private and public concerns, the matter had been one of considerable difficulty, as they would appreciate. A sub-committee was formed which met on various occasions both the Municipal Association and the unions, and he was pleased to say that the draft constitution of that proposed council was well in hand, and would, they hoped, shortly be submitted to all the members for their approval. He would read the proposed objects of such National Councils; they were practically taken out of the original Whitley Report, and these items were put forward in the interest of the tramway undertakings. The objects were as follows—

To secure the largest possible measure of joint action between employers and workpeople by the regular consideration of matters affecting the well-being and progress of the industry as part of the national life.

It would be open to the council to take any action that fell within the scope of this general definition. Among its more specific objects would be the following—

(*a*) The establishment of District Councils and works committees.
(*b*) The consideration of measures for securing the inclusion of all employers and workpeople in their respective Associations, and for securing the observance by them of collective agreements.
(*c*) The regular consideration of wages, hours, and working conditions which affect the industry as a whole.
(*d*) The consideration of the existing machinery for the settlement of differences between various parties and sections in the industry, and the establishment of machinery for this purpose where it does not already exist.
(*e*) The consideration of measures for securing regular employment while providing the public with the most efficient service.
(*f*) The improvement of conditions with a view to removing danger to the health of the workpeople and minimising accidents.
(*g*) The consideration of safeguarding the rights of workpeople inventing or designing improvements in machinery and method.
(*h*) The supervision of entry into, and training for, the industry, and co-operation with the educational authorities in arranging education in all its branches for the industry.
(*i*) Inquiries into special problems for the industry, including the comparative study of the organisation and methods of the industry in this and other countries, and, where desirable, the publication of reports.
(*j*) The collection of statistics and information on matters appertaining to the industry.
(*k*) Representation of the needs and opinions of the industry to the Government, Government departments, and other authorities.
(*l*) The consideration of any other matters that may be referred to it by the Government or any Government department.
(*m*) The consideration of problems of reconstruction and labour resettlement after the war in so far as they affect the industry.
(*n*) Co-operation with the joint industrial councils for other industries and other bodies to deal with problems of common interest.

Those were the summarised headings for the proposed National Councils. They would appreciate that they were very far-reaching and of some considerable importance, and the object he had in giving the headings was to invite their views with regard to any points they might think would be of assistance to the committee dealing with the matter. Under the Whitley Report, National Councils are to consist of an equal number of employers on the one side and employees on the other. Of course, in their case the employers would have to be divided under two heads—municipal undertakings and company undertakings—and owing to the fact that the municipal undertakings are considerably larger in number than company undertakings, in all probability the latter would have to have a larger number of municipal representatives. The number had not yet been settled, but no doubt it would have to be in the neighbourhood of 7 to 4. For that reason the sub-committee were of opinion that the companies should have some safeguard when voting on questions which would differently affect the two sections. They proposed to put in a clause that in such cases no point should be carried unless there was a majority of each section of the council on that special point. That proposal had not yet been agreed to, but they welcomed any suggestion that members of that Association might put forward with regard to such protection. That was as far as they had gone at present, but they hoped in the near future to have the whole draft constitution completed, so that copies could be submitted for consideration to each member of the Association.

Mr. James Devonshire (chairman of the Tramways (Board of Trade) Committee), said it might be interesting to members to be reminded of what was going on now on somewhat similar lines in connection with the work of the Ministry of Labour. They knew that a large number of advisory committees had been set up by the Ministry of Labour to assist in the training of discharged sailors and soldiers. These men were not all physically fit, but they were coming into the labour market, and their sympathies went out to them. He had the honour to represent the council of that Association at the Ministry of Labour in connection with the employment of disabled sailors and soldiers at electric lighting and power supply works. As Mr. Edwardes had pointed out, there were to be an equal number of employers and employed on industrial councils, and in the case he was speaking of they had the Tramways and Light Railways Association, the Municipal Tramways Association, the I.M.E.A., the Electric Power Companies, the Scotch Electrical Contractors' Association, and the English Electrical Contractors' Association, i.e., five employers' bodies, and opposite to them were five trade unions. When they first started in a small way in connection with substitution switchboard work, the chairman was the nominee of the Ministry of Labour, but as they were now working in a somewhat more ambitious way, the Minister of Labour expressed the hope that these ten bodies would nominate their own chairman. It might be of interest to them if he said with all modesty that the trade unions proposed that he should take the chair, and he had occupied that position ever since, the vice chairman being the general secretary of the E.T.U., Mr. Rowan. They might be glad to know that the committee was now called the National Advisory Committee for the whole of Great Britain and Ireland in connection with the employment of disabled sailors and soldiers for all electrical work other than the manufacture of any electrical material. He thought that this kind of work, now being carried on at the Ministry of Labour by a number of advisory committees for different trades throughout the country, was a very good omen, and a good model for the industrial councils about to be established. At any rate, so far as his experience was concerned, their relations had been most cordial with the trades union representatives. Of course it was quite true that they had a bond of sympathy, for

Digitized by Google

both parties were most anxious to extend the right hand of friendship to these disabled men, but at the same time it was a good start. He had every reason to think that it was a good foundation for the establishment of the industrial councils. (Applause.)

Mr. W. Thom asked what the probable proportion would be for each undertaking as regards men and staff.

The Chairman said that Mr. Edwardes had stated the lines on which the work was proceeding. The Ministry of Labour supplied them with a very full memorandum embodying the various terms which had been considered by a number of industries, and it resolved itself into a question of selecting from that memorandum special points likely to be suitable to the conditions of the tramway industry. The proposals were very wide, and they were naturally left as wide as possible, so that the body itself could build up its own constitution, and develop on the lines found most suitable. He had attended several meetings of the committee, and he must say the discussion was carried on in an exceedingly good spirit by both sides. All the troubles were quite openly discussed without minimising difficulties, and the difficulties and troubles of both sides were fully recognised and taken into consideration. There were matters which must from time to time differently affect the two branches of employers, that is to say, the privately owned and the municipally owned undertakings, especially in matters concerning legislation. It was therefore very necessary when matters which differently affected the two sections came up for discussion that provision should be made for a majority vote by the two branches of the employers on the employers' side. That matter was now under discussion between the two associations, and he had good hope that some settlement which would be acceptable to both sides would be arrived at.

Mr. H. L. White said he would like to ask what opportunity individual members of the Association would have of expressing an opinion upon the report before it was actually adopted, because they had only heard the outlines from Mr. Edwardes that day.

The Chairman said that it was proposed when the draft was finished that it should be submitted to a conference of the employers when every company representative present would be able to express his views.

Mr. Edwardes, replying, said that with regard to the point raised by Mr. Thom as to the representation of undertakings, they knew the Whitley Report suggested a National Council, a District Council, and a Shop Committee, and he took it that the constitution of the Shop Committee would have equal representation of the unions and equal representation of the staff. The Minister of Labour would prefer that the National Council be appointed first, then the District Councils, and finally the Shop Committees.

INCREASED FARES.

Mr. A. L. Barber (secretary, Metropolitan Electric Tramways, Limited) said he had been asked to summarise the events which led up to the promotion of the Statutory Undertakings (Temporary Increase of Charges) Bill, which was before Parliament, and this gave him an opportunity of paying a tribute to the untiring efforts made by the council during the past twenty months to secure for the tramway industry some relief from its ever-increasing burdens. But for the perseverance of the council in keeping this question continually before the Board of Trade, it was very doubtful whether they would now be in a position to criticise a Bill which had been introduced with the object, amongst others, of enabling tramway undertakings to pay their way in these difficult times.

The history of the efforts of the Association were set out clearly in the Association's Journal for April last, and it was therefore only necessary for him to refer briefly to the various steps taken. After some correspondence with the Board of Trade dating from November, 1916, and August, 1917, a deputation was received by the President in November, 1917, when the announcement was made that a committee would be appointed to deal with tramway matters. This committee was shortly afterwards set up as the Tramways (Board of Trade) Committee. It was hoped that the appointment of this committee would lead to some steps being speedily taken to assist those tramway undertakings which were financially hit by the war, and this hope was encouraged by the fact that, according to the explanatory list of functions of the committee, as published in the Board of Trade Journal of January 3, 1918, they were to consider such applications for the revision of fares as might be referred to them by the Board of Trade, and to make recommendations as to the action to be taken. Further correspondence followed, and the position became aggravated by the granting of awards by the Committee on Production giving to the men increased war bonuses.

In April the President received another deputation from the two associations, and schedules showing the financial position of a number of companies were sent to the Board of Trade. The President announced to the deputation that he proposed to ask Parliament to appoint a Select Committee to deal with the question of increased fares. Many were inclined to be disappointed, as this implied further delay in dealing with an urgent question, but it was felt that the President had no alternative, as he had promised Parliament that the question should not be dealt with without it being first consulted.

On April 24 a Select Committee was duly appointed by the House of Commons, the terms of reference to that Committee being as already published in the journal for May. Evidence on behalf of the two associations was given on May 8 by Mr. C. J. Spencer, for the Municipal Tramways Association, and by Mr. Howley, their vice-chairman, who most ably put the case for the companies. That the Committee were greatly impressed by the evidence put before them is proved by the recommendations contained in their report.

Those recommendations are of a wide and general character, and appear to call for legislative action confined solely to the industry, on the condition of which the Select Committee were asked to report. About the same time as the Tramways Select Committee was taking evidence, another Select Committee was sitting dealing with the financial hardships of gas undertakings. The reports of the two committees were isued about the same time, and the Board of Trade appear to have at once decided to deal with the recommendations of the two committees in one Bill rather than have a separate Bill for each.

The decision of the Board of Trade to deal with the matter in this way was another disappointment. There were many distinctions between tramway undertakings and gas and water undertakings, and, moreover, it was to be feared that by being mixed up with these other industries they might meet with further delay in securing for the tramway industry the relief of which it was in such urgent need. This was the view taken by the Association, and on July 8 they addressed a further letter to the Board of Trade, expressing their disappointment that the Government had included in one Bill gas, water, electricity, and tramway undertakings.

Coming now to the Bill itself, he proposed to summarise its provisions so far as they related to tramways. Clause 1 provided that where it appeared to the Board of Trade that the financial position of any tramway undertaking had been adversely affected by the war, they might, if they thought fit, provide for the modification of any statutory provisions regulating the charges to be made by the undertakers and of any statutory provisions consequential on, or supplemental to, any such provisions as aforesaid.

Then came a provision which was perhaps the most important part of the Bill. This proviso was as follows :—(*a*) In the case of a municipal tramway undertaking, no modification might be authorised which would increase the statutory maximum charge by more than 50 per cent., or which is more than sufficient to enable the undertaking to be carried on without loss. (*b*) In the case of a company-owned tramway undertaking, no modification was to be authorised which was more than sufficient to enable a dividend on the ordinary stock or shares of the undertaking to be paid at half the average rate of dividend paid for the three financial years immediately preceding the war.

All of them would agree that if this proviso stood without amendment, publicly-owned undertakings would receive better treatment under the Bill than companies. In the case of the former they would secure their interest and sinking fund on the capital expended on the undertaking, whereas, in the case of companies, those which in the pre-war period paid a dividend on their ordinary stock or shares must suffer the loss of one-half such dividend before they could obtain relief.

Clause 1 further provided that any application from a tramway undertaking to the Board of Trade was to be accompanied by such information, certified in such manner as the Board of Trade might require, with respect to the financial position of the undertaking in question. Sub-section 4 of Clause 1 stated, inter alia, that statutory provisions include the provisions of any Order having the force of an Act. In regard to this point, the power of many companies to charge the ordinary Parliamentary fare of 1d. a mile was subject to restrictions imposed at the instance of local authorities. Where these restrictions were in the form of a clause in an Act or Order, the Board of Trade would apparently have power to override them, but there was nothing in the Bill to empower the Board of Trade to modify any restrictions which were not to be found in the statutes of the undertaking, but were merely embodied in agreements between the undertakers and local authorities or other parties. Clause 2 of the Bill dealt with the application of its provisions to Scotland and Ireland. Clause 3 gave the short title of the Bill, and fixed the period during which it was to have effect ; for the period of the war and two years after. In this latter respect the Bill followed exactly the recommendation of the Select Committee. So much for the substance of the Bill as deposited.

As soon as the Bill was published, the Council of the Association gave it careful consideration, and made arrangements for two amendments to be proposed in the House. The first amendment referred solely to company-owned undertakings, and its effect was to suggest that the Board of Trade should have power to modify the fares and charges to such an extent as would enable companies to earn 5 per cent. upon the capital properly expended on undertakings. This would practically put companies on the same footing as municipal undertakings.

*** The full text of the Bill as passed is given on page 103.

853640

Digitized by Google

It would be observed that the amendment suggested 5 per cent. on the capital properly expended, and not on the debenture and share capital issued. It was felt that to ask for recognition of the capital issued would arouse considerable opposition, as few of the companies could deny that there was a considerable amount of water in their capital. The second amendment asked for was the insertion of a proviso that any modification of fares so authorised should not be less than one halfpenny. On some of the smaller undertakings, where the number of important traffic points was comparatively few, any increase of fare by way of a further adjustment of the fare stages may be impossible, or rather may not result in any increase of revenue. To meet this point it was thought desirable to ask Parliament to agree to the second amendment.

There were just one or two other remarks he wished to make. Even if the Bill passed with their amendments incorporated, their troubles would not be quite at an end. Each undertaking would have to make application to the Board of Trade for its own particular case to be considered, and would have to furnish such information as the department might require. There was one other important point. As he understood the Bill, those applications would be considered by the permanent officials of the department, and would not, as some of them once hoped, be referred to the Tramways (Board of Trade) Committee, the members of which were all tramway men, well acquainted with the practical problems of tramway operation and management, and with the many difficulties which beset them in these days of war.

Mr. C. D. Stanley observed that as regards the Bill, it seemed to him that the clause to which Mr. Barber had drawn special attention knocked the bottom out of the whole thing. The essence of the business was that there should not be interminable delay, and if the restrictions were imposed by the clause questions would arise, not only as to what capital had been properly expended but a host of other questions, such as what sum was properly set aside for depreciation, what had been or could be properly done in the matter of deferred repairs, and so forth. In fact there would be dozens of questions like that, and it seemed to him that by the time all these questions had been thrashed out it would be a year or eighteen months before they got any relief. Therefore he did not see how they could hope for very much relief as long as that was operative. He did not know whether it was possible to get that removed or modified, and to have it simply left on the recommendation to give them an amount, such as the 50 per cent. suggested. He joined with Mr. Barber in hoping that any case that was submitted to the Board of Trade might be turned over to the Tramways (Board of Trade) Committee. On that Committee they had men with a practical knowledge of tramways, and practical common sense, and they would realise the necessity for dealing with these things quickly. He thought that was a very important point.

Mr. E. H. Edwardes asked the chairman if he could inform the meeting whether the Bill had been submitted to the Advisory Committee of the Board of Trade, or did that Committee know anything about it. It seemed to be rather peculiar that this Committee, specially appointed by the Board of Trade to consider matters appertaining to tramways, should not have been consulted. Were these clauses considered by them, or submitted by them, or did they know nothing about them ?

The Chairman replied that all he could say was that the Committee were not responsible for the Bill.

Mr. B. Hatton said they had heard a very interesting broad statement from Mr. Barber as to the treatment of Corporations and companies in regard to interest and redemption. Companies were to have capital guarantees to them of fares which would yield the interest of previous years. But what about those municipal undertakings which had been returning money to the relief of rates ? Would that go by the board ?

Mr. H. L. White.—They ought never to have paid it.

Mr. Hatton rejoined that that was not the point. Mr. Barber was now asking the Government to guarantee a 5 per cent. return on their stock. Very well, if they were going to do that when railway control formed a gilt-edged security, it would put them in a very different position from what they were in to-day. He said the bulk of it was paid-up capital, and he believed that was so. But the first thing to do was to make all companies and Corporations make returns of their working expenses in exactly the same form, so that one could be compared with the other, capital and working expenses, and then they would be able to obtain a better understanding of things as they stood. It seemed to him that when the war broke out everybody thought they were going on the rocks, but some of them had done better, and some had done worse, and now it seemed to him that the trouble of the companies was that in some cases where other people had made war profits—he was not speaking of tramways alone, but of other industries as well—they were now prohibited from making those war profits. Well, it was very clear to anyone who looked at the matter from the amendment, while the Government permitted a private company to make war profits, they would not allow other undertakings transporting the public to do the same thing. That was the basis of the matter, and if the companies were guaranteed fares which would give them pre-war dividends—for two years after the war—obviously there would seem to be a preferential treatment.

Mr. H. L. White thought the remarks of Mr. Hatton from the municipal side were most interesting to those who, like himself, represented company concerns. He thought some of those remarks, from the point of view of producing harmony between the two sections of tramway industry of municipal and company, might very well have been dropped. For instance, Mr. Barber was quite justified in saying that the companies would be more heavily hit by this proposed legislation than the municipal concerns. Mr. Hatton had referred to those undertakings which had been so prosperous that they had been able to make payments to the benefit of the rates, and he probably wanted to know whether Parliament was going to continue by some means to enable those undertakings to pay those amounts to the rates. So far as the companies were concerned, what they said was this—that they were entitled to the same dividends that they received before the war. He did not think any of them would ask to be allowed to receive more, but for the Board of Trade in their Bill to cut them down to one-half of what they were earning before the war did seem to them very hard, and he only hoped that those members of the council who represented companies would be able to induce those members who were on the municipal side on the council to share that opinion, because otherwise it seemed to him that the interest of the purely company undertaking was going to be sacrificed.

Mr. A. V. Mason (general manager and engineer, South Metropolitan Electric Tramways and Lighting Company) said that he did not see what good the Bill would be to anyone unless the companies were allowed to increase their rates so that the full pre-war dividend could be paid, or fixed at not less than 5 per cent. If not, the public were going to suffer, as no company could afford to worry about the Bill as it stood because it was much too lean, and in order to maintain dividends the services and miles would have to be cut and further overcrowding enforced so as to earn higher pence per car-mile, and the repairs starved. Workmen's services would also have to be reduced to a minimum. Workmen's fares were quite inadequate, and must improve, or the renewal fund would suffer. To-day, speaking quite managerially, every extra cent earned due to inflated traffic ought to be put back because the repairs were only patched work, especially permanent way, and after all these extra earnings were things of the past with the new award just published, so that all the Bill would do would be to hamper the companies, and give the public a very much worse service. The latter should not be forgotten.

Mr. A. L. Barber said that Mr. Mason's point only brought him back to what he had said in his opening remarks. If all these obligations were referred to a practical Committee like the Board of Trade Committee it would have no difficulty, he thought, in dealing with those sort of points. It might be that was the intention of the Board of Trade, but there was, of course, nothing in the Bill to say what the procedure would be. With regard to Mr. Stanley's point, the history of this matter had been a story of delay, and it looked as if they were not through with the delays yet, but they were a little bit nearer than when they first started twenty months ago.

The President of the Association (the Right Hon. Viscount Chilston) arrived at this stage and took the chair.

COAL RESTRICTION ORDER.

Mr. W. E. Hardy (manager and electrical engineer, Bath Electric Tramways Company), in opening the discussion on the Coal Restriction Order, said it struck him that of all industrial consumers of electric power, tramways up to the present time had been singled out in the call made upon them for economy in coal. Perhaps it was that tramways were easily accessible by Government departments. While this might be advantageous to tramways in many instances, he could not help thinking that in the case of the Coal Restriction Order it had operated in an adverse direction. With the advent of the new Order for rationing coal for householders, the question of the 15 per cent. reduction of consumption of electricity by ordinary consumers was in reality wiped out, and even the favoured North came into this scheme, so that he would not be surprised to learn that considerable modifications might be made in the Coal Restriction Order as applied to tramways. In the instructions sent out to tramways by the Tramways (Board of Trade) Committee on April 20 last, which affected all tramways in the southern part of England, these tramways were required to reduce their coal consumption by 15 per cent. In the case of those tramways which purchase electrical energy, this was interpreted, and he believed rightly so, as reducing the number of units used by 15 per cent., but in the case of tramways which supply their own power it meant a 15 per cent. reduction in their coal consumption. Now a 15 per cent. reduction in coal consumption meant considerably more than a 15 per cent. reduction in service, because the standing losses in a power-station would be practically unaffected. Therefore the tramways with their own power-station were harder hit by the Order than those who purchased their current. On the other hand, as a set-off against this, " the partial substitution of coke, locally produced, for the coal at present consumed " which was allowed, was certainly some compensation to tramways which had their own power-stations.

Digitized by Google

He proposed just to say a few words about the burning of coke, or rather coke breeze; he said "or rather coke breeze" because as the new rationing order permits of 3 tons of coke being taken in place of 2 tons of coal, and as it was a fact that in domestic grates the radiant heat of coke was considerably in excess of the radiant heat of coal, it was far more economical from every point of view for people to burn coke in open grates in preference to coal. For this reason he did not think there would be a great deal of coke, i.e., screened coke, available. On the other hand, coke breeze had been more or less difficult to dispose of, and stocks had been accumulating at many gas works in the country. If, therefore, coke breeze could be used in tramways power-stations, it would go far to minimise the drastic curtailment of the car services which was at present entailed. Tramway services all over the country had been very much reduced since the outbreak of the war, and it could not be in the public interest to call for a much greater curtailment. The successful burning of coke breeze had been, and was being, carried out on mechanical stokers assisted with forced draught, and also on hand-fired furnaces with steam blowers. Personally, he did not advocate the use of steam blowers where they could be avoided, and any alteration involving new plant was a difficult matter in these times. If, however, one was prepared to reduce the output per boiler, and make up by putting an additional boiler or boilers under steam, coke breeze could in most cases be burnt successfully on the existing furnaces either by itself or mixing with coal. Where a boiler plant was working at its full capacity, of course, the necessary margin was not available, but even in these cases there were times when the load was not so heavy, and it would often be found that a proportion of coke breeze could be burnt. The intensity of draught had a very important bearing upon the successful burning of coke breeze, but at most electric power-stations the draught is good. In his own case he had been able to reduce the coal consumption by about 50 per cent. by burning coke breeze. He burnt it on a hand-fired furnace and on chain grate stokers with Babcock boilers. On the hand-fired furnace, burning coke breeze by itself, and with four-tenths of an inch draught at the boiler damper, he had found it to be possible to burn 13 lb. of coke breeze per sq. ft. of grate area per hour, which gave considerably more than half the normal output of the boiler. On the chain grate stoker fitted with a refractory arch, it was possible to obtain good ignition, burning one of coal and three of coke breeze by bulk. The chain grate stoker with an ordinary setting, one to one by bulk proved to be quite satisfactory. Of course there were disadvantages in burning coke breeze—additional clinker had to be dealt with, more labour was required, the boilers had to be sooted more often from what he might call sparklets which come from the coke, and more attention generally was required; but on the other hand, the price of coke breeze as compared with coal should more than compensate for this. The advocates of burning coke, by this he meant gas companies, claimed that a better boiler efficiency could be obtained with coke under ordinary conditions than with coal, owing to the risk of waste with coal by not properly consuming the hydrocarbon gases, and there was a good deal to be said from their point of view, although up to the present time he had not proved it himself. He thought it might be accepted as a general proposition that the lower the grade of fuel the more difficult it becomes to maintain a high boiler efficiency. On hand-fired boilers care should be taken to avoid as far as possible the blue flame at the top of the fire. This blue flame indicated incomplete combustion, which might be due to too thick a fire or clinker on the bars. The first trials of coke breeze would probably not be satisfactory; firemen were against it, and very often put every obstacle in the way, but by a little persistency, and by starting in easy stages, it would be generally found that it would be possible to increase the percentage of coke breeze burnt in a very short space of time. He hoped the discussion would elicit the views of those who have combined stations in the matter of burning coke breeze.

Mr. J. R. P. Cox referred to experiments which he had carried out, and said the question was whether there would be enough coke breeze to go round. Other people had gone into the matter and found it very cheap. But there was a considerable quantity of low-grade fuel still available. He could get it in large quantities, and it was certainly more suitable to use mixed than coke breeze. If they could get a low-grade fuel he certainly thought it was better under ordinary conditions than coke breeze, and those low-grades were available. Having been appointed the local representative of the Coal Controller in Edinburgh, he was in a position to know something about it in many places.

Mr. Howley asked if there was any difficulty in getting coke to light back on a chain grate.

Mr. Cox.—Not with a draught, especially a natural draught.

Mr. Edwardes asked Mr. Hardy if he had tried to burn coke breeze in an underfeed stoker. He had got hold of some coke breeze a few months ago—there was only a limited quantity in Lancashire—and he had been quite unable to burn it in an underfeed stoker.

Mr. Jewell said his company had tried coke breeze, had burnt 40 tons a week and used forced draughts and steam jets. Slack was used in the proportion of about three to one.

Mr. H. L. White said at his generating station they burnt coke breeze in 1913 and 1914, and found a very considerable economy as compared with coal, but last year they found it was the other way about. The quality of the coke made all the world of difference, and they found they were consuming more in cash in using breeze than they were paying for coal, because their coal was obtained very cheaply. It might interest them to know in 1913 coke breeze was got as cheaply as 2s. 6d. a ton, a very good quality; and now they had to pay 7s. from the local gas company. So they had gone back to the old condition of things, and preferred coal. They used forced draught boilers and steam, and they could burn any rubbish practically in their Lancashire boilers by that means. But still beggars could not be choosers, and if they could not get coal they must get breeze.

Mr. A. L. C. Fell remarked that on that occasion he felt very much like Dr. Jekyll and Mr. Hyde. On the one hand, like Dr. Jekyll, because he represented the Tramways (Board of Trade) Committee, and like Mr. Hyde because he was a miserable person who had to burn coke. He did not like to say too much about the work that was being done by the Board of Trade Tramways Committee. All he could say on that head was that he knew there was a further communication going out which would be applicable to all tramway undertakings in the country with regard to economy in fuel and the possibilities of burning coke. In his other personality, he could say they were at present burning coke at the Greenwich generating station. They were saving over 16 per cent. of coal at the present time. They were burning coke in two ways; one way was burning coke on underfeed stokers, and in the other way they were burning it on the ordinary chain grate stokers with Stirling boilers, and in that case the coke and coal were being fed in layers. They had two shoots down from the hopper overhead, so that they fed the coal and coke at the same time, and they got a layer of coke underneath the coal, and they got very good results. He thought they were getting as high an economy as they were from ordinary coal, but one of the greatest difficulties at the moment was with the underfeed stokers. The heat was so great in the furnaces that they had the greatest difficulty in keeping up the arches, and they had to be renewed very frequently. They hoped shortly to have the full results of the trials which were being made with those stokers which had been fitted up at the generating station, and he had no doubt they would be laid before the Association for consideration by the members.

Mr. A. V. Mason said that some experience he had with coke at a small lighting station in a town in the suburbs, viz., Sutton, might be of interest. Coke breeze was used quite successfully there in the proportion of two coal slack and one coke. They had no trouble with combustion, and obtained a good evaporation as long as the mixture was well mixed, in fact, turned over like concrete. They used it for quite a long time in pre-war days before they shut down in favour of bulk supply. They really gave it up because the quality decreased and the price increased, and the coke grit wore out the sliding bars of the coke stokers; also the wet steam forced draught was carried through to the economiser pipes, or it might have been the low flue temperature mentioned by another speaker which caused the tubes to sweat and get heavily caked. The worst trouble was that the extra draught necessary caused a lot of the fine grit to be carried up the chimney, and as the station was situated among good class residences they had a lot of complaints (those troubles were merely incidental), but the experiment was made not with a view to save coal in those days, nor was it due to any coal restriction order, but merely as a matter of £ s. d. As long as the mixture was good they had no trouble in getting reasonable duty out of their boilers.

Mr. Hardy asked if sprinklers were used.

Mr. Mason.—No.

The President pointed out the subject before the conference was the Coal Restriction Order. Some members had views on the application of the Order, and the members would be glad to hear them.

Mr. H. England said they were chiefly concerned with economy in the use of coal. In the North there had been no compulsion yet as to any reduction. There was a forecast of something like 15 per cent. reduction. They were concerned that a clean cut should not be made, for the reason that some undertakings had by reason of the shortage of labour been compelled to cut down their services. Therefore their consumption of coal was on practically bed rock. That was in consequence of the letters issued by the Tramways (Board of Trade) Committee in March last, advising economy in the use of renewals and spare parts, and so they had voluntarily cut down the services. Those undertakings were now running practically the minimum mileage that could be run if the undertaking were to give an efficient service, while other undertakings better placed were running the same services which they did two or three years ago. They therefore thought that it would be a wrong thing for any department to call upon every undertaking to reduce its consumption by 15 per cent. They thought that there ought to be some means of ascertaining the circumstances of each particular undertaking. Some return ought to be made showing what, if any, reduction should be made on some proper basis. It was obviously

Digitized by Google

unfair that an undertaking maintaining its pre-war mileage should only be penalised in the same way as those undertakings which were only running 50 per cent. of their pre-war mileage, and so they did protest that any clean cut should be made, and urged that no order should be issued calling upon every undertaking to reduce its coal consumption by a certain amount.

Mr. Stanley asked what exactly the 15 per cent. reduction was to take place upon. Was it the actual present consumption?

Mr. Hardy, in reply, said he was afraid he could not answer the question about the 15 per cent. reduction. Perhaps Mr. Fell, who had just announced some new regulation was to be issued, could say, but so far as the letter of April 20 last was concerned with regard to tramways in the southern districts, it certainly meant that there was to be a 15 per cent. reduction on present or then existing consumption. His remarks in regard to coke were due to the fact that tramways had cut down their services to such a degree that coke breeze fuel could be substituted to maintain those services as they are at present, that it would be a great help to the undertakings, and that was the one good point about the latter which allowed of the burning of coke breeze. With regard to Mr. Cox's advocacy of a low grade fuel, of course that was coal, and the 15 per cent., of course, came off that. Coke breeze was not fuel, although it might be in the future regarded as fuel. Mr. Edwardes asked about the burning of coke breeze with underfeed stokers. He had seen a case recently where coke breeze had been burnt successfully for several years past, and was still being burnt. Mr. Jewell referred to steam jets, and seemed to agree that steam jets were an abomination, and he (the speaker) was not surprised that he did not get good results, and said he was burning three times as much coal as coke. Probably it was due to the steam jets that they got a large percentage of c.o. up the chimney. Mr. Fell referred to the fact that he had a saving of 16 per cent. by coke at the Greenwich generating station. The method he described of burning coke breeze with a layer of coal on top had been found to be far more satisfactory up to the present. He understood, however, that it was burnt with good grade fuel, and that helped it very greatly. With regard to the underfeed stokers Mr. Fell mentioned, he took that what was meant was underfeed coke grate stokers.

The President then closed the conference by proposing a hearty vote of thanks to Mr. Howley, Mr. Edwardes, Mr. Barber, and Mr. Hardy for opening the discussions. He expressed regret that he had been unable to have the privilege of hearing the whole proceedings, but he had been engaged at another meeting.

The motion was agreed to with acclamation, and the proceedings terminated.

THE ASSOCIATION DINNER.

Following the Congress, the annual dinner took place in the evening at the Trocadero Restaurant.

The President (the Rt. Hon. Viscount Chilston) occupied the chair, and the following members and guests were present:—

R. A. Abbott.
G. H. Anger.
C. G. Ashdown.
S. E. Baker.
Geo. Balfour.
A. Balfour.
E. S. Barralet.
H. R. Beken.
W. W. Beaumont.
E. Benedict.
H. E. Blain.
F. Bland.
A. H. Beatty.
C. Bickersteth.
F. Bourne.
J. K. Bruce.
J. Browning.
C. Burnet.
C. L. Buckley.
S. W. Callow.
J. M. Cayter.
Viscount Chilston.
Col. A. W. Chambers.
E. Collins.
H. P. Conibear.
F. Coates.
F. Coutts.
G. F. Craven.
W. D. Dawes.
A. de Turckheim.
Capt. H. P. di Marco.
J. W. Dillon.
E. H. Edwardes.
A. Ellis.
H. England.
E. H. Fleming.
A. L. C. Fell.
J. Fry.
O. T. Gibb.
A. W. Greenwall.
H. Gerny.
T. B. Goodyer.
W. G. T. Goodman.
W. H. Hawley.
C. J. Haines.
S. Hann.
E. Hatton.
E. A. Heath.
H. Holliday.
R. J. Howley.
Joe Hunter.
A. A. Holm.
A. J. Hollington.
W. T. Hill.
F. Hewer.
W. S. Hopking.
H. G. Hughes.
J. S. Huddleston.
L. E. Harvey.
W. E. Ireland.
F. Irvine.
W. Ivey.
A. H. Jackson.
F. P. Jackson.
C. J. Jewell.
E. R. James.
A. Johnson.
B. Kingsford.
C. Y. Knight.
F. W. Ketley.
J. J. Kelly.
S. Loosen.
E. H. Lean.
W. L. Lorkin.
F. G. S. Littlefield.
Alex. McCallum.
A. R. McCallum.
H. Martin.
H. T. Maynard.
J. F. Moss.
Capt. L. M. Myers.
J. C. Mitchell.
Coun. R. Mayne.
A. V. Mason.
—. Mundy.
—. Manley.
C. T. Mabey.
F. W. Napier.
A. Norton.
—. Ormerod.
W. B. Pickering.
A. Pye-Smith.
F. E. Saunders.
C. J. Spencer.
H. G. Scowne.
L. Slattery.
H. K. Spark.
H. E. Smith.
C. D. Stanley.
C. V. Stanley.
G. Saies.
R. T. Simcock.
W. R. Spaven.
W. A. Stevens.
Ald. W. Smith.
A. H. Silcock.
G. J. Shave.
G. R. Spurr.
H. E. Stranack.
W. Thom.
J. B. Tippets.
H. E. Townell.
C. G. Tegetmeier.
A. W. J. Talbot.
W. H. Troake.
Coun. Timpson.
W. H. Turner.
L. V. Thornbury.
H. J. Troughton.
H. Vorley.
W. W. Wakley.
A. M. Willcox.
H. L. White.
A. G. Whyte.
J. Welling.
P. R. Wray.
W. Wyld.

As has been usual in war time, there was no music, toast list, or official speeches.

The usual loyal toast was duly honoured.

During the after-dinner conversation the **President** said they might be glad to hear that a higher authority than himself had decreed that there should be "no speeches," but he really could not let them separate without expressing to them a warm welcome to the annual dinner. He fully realised the difficulties of travel, for they had fewer trains and an addition of 50 per cent. on fares, and a few other things of that sort; but he was glad to see them present in such numbers to show their interest in the Association. While he was glad to see them present he could only regret that his friend and colleague, the Hon. Sir Arthur Stanley, chairman of the council, could not be with them, as he had been suddenly smitten with Spanish "flu." Than Sir Arthur he knew of no man in London with greater power of making happy after-dinner speeches, and they probably all looked forward to seeing him at their festive board. He was also sorry because, owing to the fell disease having seized Sir Arthur, it had upset their mutual plans, so that he (the president) had had to undertake other duties, and so absent himself from part of the afternoon's Congress. Last year it was his pleasure to take the chair at the Congress, and he had hoped that this year he might have been able to join in their discussions. Without wishing unduly to "talk shop," he had noted that at the Congress they had discussed four important subjects. Nowadays everything seemed to tend towards formal control, and he would like to express (perhaps it was a rather old-fashioned idea) his hope that when the war was over they would all be able again to think of independent enterprise. (Hear, hear.) They must guard against being entirely content with "controlled" this and that, and so allow independent enterprise to be entirely squashed. (Hear, hear.) They were meeting in an anxious time in regard to the war, and he would be a bold man who would venture to say when the war would conclude. However, that day was France's day, and they would like to bear in mind the faithful ally with which they were associated. They had had four years of war, and he would like to say again (it had become a homely saying) that they were not going to drop the war until Britain and the Allies came out top dog and until the Allies could control the peace terms. (Applause.) Though the war was still with them they remained as full of hope and confidence and determination to come out on top as they were four years ago. Still he recognised the difficulties of carrying on; and those difficulties were being accentuated. There was the increased cost of coal—(hear, hear)—the increasing difficulties in regard to labour. More men were required at the front each year, and they must be drawn from some of the industries, and many of them had been withdrawn from their own industry. Whether or not the other sex could fill the space was a question on which they would be better able to speak than he could himself. But at any rate he thought the girls working on the cars had done extremely good work, though perhaps it would not be well to trust some of them to take a heavy load downhill. Nor could the girls be recognised as just as fully capable as the male sex. However, the women had done their duty extremely well, and had helped the tramways extensively, for which they all felt grateful. Referring again to the Congress, the President regretted he was not present when they discussed the division of rates. He did not think they had been fairly treated in that matter. Tramways ought not to be coupled with other industries that could not make out so good a case as tramways could—they would be wise to fight that to the end. He trusted that for many future years they would assemble at their annual dinners, and that when the war was over, and when victory had been satisfactorily won (nothing less than that being possible), they would be able to foregather in greater force (although the present gathering was not at all a bad muster) and with greater interest to themselves and with greater benefits to the Association. It had been suggested to him that they should allow a collection to be made round the table for the French Red Cross Fund.

This was done, and a sum of £20 was collected.

Mr. R. J. Howley (vice-chairman of council) proposed the health of their president, Viscount Chilston. He expressed the pleasure of the council at seeing so many members present at the dinner, which proved that the Association was not only carrying on but was really "alive." He hoped the council would be able to give more time after the war to the difficulties besetting the tramway industry, and produce gratifying results for the members.

Mr. Harry England seconded the toast, and added his tribute of esteem for the president and his pleasure to see him present. At the same time he regretted the absence of the chairman of council, and the cause of that absence. At the Congress a gentleman asked him if the chairman of council was elected every year, and he (Mr. England) replied that that would be absurd, because without their chairman there would be no Association, and he could say almost the same thing about their president.

The **President,** in response, thanked them cordially for the handsome tribute paid to him and to his efforts in the chair. He felt it a great privilege to be president of the Association, and he again expressed regret for the absence of Sir Arthur Stanley. He then spoke of the work of the French Red Cross and of Sir Arthur Stanley and our own Red Cross work.

The health of the secretary (Mr. A. de Turckheim) was then proposed by **Mr. H. B. Blain,** and very cordially received by the company.

Digitized by Google

AN ACT TO INCREASE STATUTORY CHARGES.

THREE-QUARTERS OF THE PRE-WAR RATE OF DIVIDEND GUARANTEED.

The following is the text of the Statutory Undertakings (Temporary Increase of Charges) Bill which, as amended, was read the third time and passed by the House of Commons on July 24 and by the House of Lords on August 2. It received the Royal Assent on August 8. The Bill enables the statutory provisions affecting the charges which may be made in respect of certain undertakings, including tramways, to be modified during the continuance of the present war, and for two years thereafter. The amendments made in the Bill after it was introduced by Sir Alfred Stanley, President of the Board of Trade, are indicated by italics.

1. (i.) Where it appears to the appropriate Government department that the financial position of any undertaking to which this Act applies has been adversely affected by circumstances arising out of the present war, the Department may, if they think fit, by order provide for the modification of any statutory provisions regulating the charges to be made by the undertakers, and of any statutory provisions consequential on or supplemental to any such provisions as aforesaid, for such period during the continuance of this Act, in such manner, and subject to such conditions, as appear to the Department to be just and reasonable:

Provided that—

(*a*) Where the undertakers are a local authority no modification shall be authorised which will increase the statutory maximum charge by more than 50 per cent., or which is more than sufficient so far as can be estimated to enable the undertaking to be carried on without loss; and

(*b*) In any other case no modification shall be authorised which is more than sufficient to enable *with due care and management* a dividend on the ordinary stock or shares of the undertaking to be paid at *three-quarters* the standard or maximum rate of dividend, if any, prescribed for the undertaking, or at *three-quarters* the pre-war rate of dividend, whichever is lower.

(ii.) An application to a department for the purposes of this Act shall be accompanied by such information, certified in such manner as the department may require with respect to the financial position of the undertaking in question, *and before making an order the appropriate Government department shall require the undertakers to give public notice of the application for an order under this Act and as to the manner in which and time within which representations may be made, and to give a similar notice in writing to the council of each county, borough, or urban, or rural district within which any part of the undertaking or limits of supply of the undertaking is situate, and the department shall consider any representations which may be duly made.*

(iii.) The undertakings to which this Act applies are tramway undertakings, including light railways constructed wholly or mainly on public roads, and undertakings for the supply of gas, water, *hydraulic power* and electricity, *and in calculating the maximum charge which may be authorised under this Act in respect of such tramway undertakings fractions of a halfpenny shall be calculated as a halfpenny.*

(iv.) For the purposes of this Act—

The expression "statutory provisions" includes the provisions of any order having the force of an Act;

The expression "appropriate Government department" means, in relation to gas and water undertakings carried on by local authorities, the Local Government Board, and in relation to other undertakings the Board of Trade;

The expression "local authority" includes any commissioners; trustees, or other public body of persons carrying on, otherwise than for purposes of private profit, any undertaking to which this Act applies;

The expression "pre-war rate of dividend" means the average rate of dividend for the three financial years immediately preceding the war.

2. In the application of this Act to Scotland the Secretary for Scotland, and in the application of this Act to Ireland the Local Government Board for Ireland, shall be substituted for the Local Government Board.

3. (i.) This Act may be cited as the Statutory Undertakings (Temporary Increase of Charges) Act, 1918.

(ii.) This Act shall have effect during the continuance of the present war and for a period of two years thereafter, and no longer.

Wages Increases.—The Committee on Production have issued an award to men in the engineering, shipbuilding, and allied trades, and in the ship repairing department in the Liverpool district, of 3s. 6d. per week to men aged 18 and over, and to boys, youths, and apprentices under 18 of 1s. 9d. By previous awards the men have received advances over pre-war rates of not less than 20s. a week in the case of time workers, and 13s., plus an increase of not less than 10 per cent., in the case of piece workers. In addition to these advances, grants have been made of a bonus of 12½ per cent. in the case of time workers and 7½ per cent. in the case of piece workers.

TRAMWAY AND OMNIBUS WORKERS' WAGES.

AWARD ON APPLICATION FOR 12½ PER CENT. BONUS.

The applications of the National Transport Workers' Federation and other organisations representing the employees, for the granting to tramway employees of a 12½ per cent. bonus, was heard by the Committee on Production on July 2. The case for the municipal tramways was presented by Mr. J. M. McElroy and Mr. C. J. Spencer, that for the Tramways and Light Railways Association by Mr. R. J. Howley, while Mr. H. E. Blain cogently set forth the case on behalf of the Metropolitan omnibus companies. The proceedings, which were of considerable interest, and indicated that some friction exists between the various representatives of the employees' organisations, occupied the whole of the afternoon, and the Committee reserved its decision.

The award was issued on July 11, and its terms are as follows:—

1.—The parties to this reference are—

(1) The Municipal Tramways Conference and the Tramways and Light Railways Association, the London General Omnibus Company, Limited, the London Omnibus Section of Messrs. Thomas Tilling, Limited, and the National Steam Car Company Limited; and

(2) The National Transport Workers' Federation.

2.—The claim submitted was as follows:—

(1) Application for an increase of 12½ per cent. upon the present total earnings or for a standard increase equivalent thereto.

(2) For such revision of the award of the Committee on Production of 8th March, 1918, as shall provide for equal payment of women as for men, both as regards war wages and basic rates.

3.—The matter was referred by the Ministry of Labour to the Committee on Production for settlement and representatives of the parties were heard on July 2, 1918.

4.—The award of March 8 provided for certain increases to the employees concerned. The nature of such increases is indicated in paragraphs 4, 5, and 6 of the award, which are as follows:—

(4) The decision of the Committee is that there shall be paid to the men concerned aged 18 and over, and to the grades of women aged 18 and over whose terms of employment include an undertaking that they shall be paid the same rates as the grades of men whose places they have filled, such advance as shall give £1 per week over the pre-war rates of the grades concerned, payment to be made on the basis of a week of six days or six shifts.

(5) In the case of women aged 18 and over not covered by clause 4, the advances now being paid shall be increased by 4s. per week, subject to a maximum of 20s. per week over the pre-war rates of the grades concerned.

(6) In the case of boys and girls and youths under 18 years of age the advances now being paid shall be increased by such amount per week as shall give the girls, boys, and youths under 18 years of age in the undertaking concerned half the additional advances given by this award to the men or women as the case may be in the same undertaking.

The award of the Committee in settlement of the claim now submitted is:—

5.—The war wages advance of 20s. a week at present paid to the able bodied men concerned aged 21 years and over shall be increased to 25s. a week, payment to be made on the basis of a week of six days or six shifts.

6.—This award shall not operate so as to depress the wages at present paid to any of the men concerned.

7.—The advance hereby awarded covers and is to be deemed to be in full settlement of any claim with respect to the bonus of 12½ per cent.

8.—The advance hereby awarded covers and shall not apply to men to whom the bonus of 12½ per cent. has been given under any order made by the Minister of Munitions or any award, or otherwise.

9.—The amount hereby awarded is to be taken into account in the calculation of payment for overtime or night duty or for work on Sundays and holidays; it is to be regarded as a war advance and is to be recognised as being due to and dependent on the existence of the abnormal conditions now prevailing in consequence of the war.

10.—This award shall not apply to classes of employees, such as building trades' operatives, whose wages have customarily been regulated by the movements in the wages of the trades in which workmen of the same classes are ordinarily employed.

11.—So far as the London General Omnibus Company are concerned, this award is applicable only to those grades of employees with respect to whom there are agreements between the Company and the London and Provincial Union of Licensed Vehicle Workers, but the award does not cover, and is not to be deemed to cover, the grades of employees dealt with in the agreement between the Company and the Union of April 11, 1918.

12.—The advance granted under this award is to be paid as from the beginning of the first full pay following the date of the award.

Digitized by Google

13.—The decision of the Committee with respect to the application for a bonus of 12½ per cent. on the earnings so far as regards women is that the claim has not been established.

14.—It was stated on behalf of the employers at the hearing that they accepted the principle that in cases in which women are doing the same work as men, and doing it efficiently, and provided their employment does not involve increased expenditure compared with the employment of men, they should be paid the same wages as men, They showed, however, that in the case of tramway and motor omnibus undertakings a large number of women employees stay only a comparatively short time, and their attendance is less regular than that of men, necessitating the keeping of a large spare staff, which adds to the cost of employing women. The decision of the Committee with reference to the application that the award of March 8, 1918, should be revised so as to provide equal payment to women and men both as regards war wages and basic rates is that the claim has not been established.

WILLIAM W. MACKENZIE.
JOHN M. DENNY.
JOHN BARKER.
H. J. WILSON, *Secretary*,
July 9, 1918. 5, Old Palace Yard, S.W.1.

EDINBURGH TRAMWAYS MANAGEMENT.

APPOINTMENT OF MR. R. STUART PILCHER.

Edinburgh Town Council on July 30 unanimously adopted the recommendation of the Tramways Committee appointing Mr. R Stuart Pilcher general manager of the Edinburgh Corporation Tramways.

Mr. Pilcher, who is 36, has been for twelve years manager of the Aberdeen Corporation Tramways, and previous to accepting that appointment he was assistant electrical engineer to Birkenhead Corporation from 1901 to 1904, and traffic manager of the Burton-on-Trent Corporation Tramways from 1904 to 1906. He was trained as an electrical engineer by the Montreal Street Railway Company. Mr. Pilcher was one of the first managers to recognise the advantage of placing energy meters on tramway cars, and to the conference of the Municipal Tramways Association in London in October, 1909, he contributed a paper on "Current Consumption," describing the notable saving that had been effected in Aberdeen by the use of meters, which he characterised as "the most valuable part of our system of check of current consumption."

The Edinburgh Tramways are owned by the Corporation, but have been worked by the Edinburgh and District Tramways Company, Limited. The lease willl expire in June, 1919, and the working will then pass into the hands of the Corporation, who desire Mr. Pilcher to take up his position as soon as possible in order that preparation for the transfer may be undertaken without delay. The tramways are worked by cable traction, and comprise 42·4 miles of track. They were fully described and illustrated in THE TRAMWAY AND RAILWAY WORLD of March 8, 1900. Plans for the conversion of the system to electric traction have already been discussed, and reports have been submitted by Mr. A. H. Campbell, the borough engineer, and Messrs. J. B. Hamilton and Peter Fisher, which were summarised in our issue of December 13, 1917. It is not, however, expected that the conversion of the system can be commenced until peace is restored.

ABOLITION OF SECOND CLASS ON THE SOUTH WESTERN RAILWAY.

On July 22 the London and South Western Railway Company abolished its second-class bookings. This step has been dictated by war conditions, although the continuous decrease in second-class long distance travel to about 2 per cent. of the traffic foreshadowed the change now determined upon. One of the results of the change will be a saving in coal which will result from the avoidance of hauling partially filled heavy main line stock. Uniformity of accommodation throughout the line will also be secured, thereby avoiding some confusion on the electrified suburban country branches, where trains have only first and third class accommodation. The second-class stock will be converted to third class as soon as possible.

The British Electrical and Allied Manufacturers' Association.—We are informed that the following firms have been elected members of this Association :—

Accumulators, Limited (London), Arora Company (Loughborough), Ashdowns (Gravesend), Associated Battery Company, Limited (Penge), J. W. Barnard (London), Bastian Electric Company, Limited (London), Belling and Company (London), Bluemel Brothers, Limited (Wolston), Brompton and Kensington Accessories Company, Limited (London), Cable Accessories Company, Limited (Tipton), Croggon and Company, Limited (London), Curtis Manufacturing Company (London), Electric and Engineering Specialities Company (Liverpool), Fuller Accumulator Company, Limited (Chadwell Heath), Griffiths Brothers and Sons, London, Limited (London), Jackson Electric Stove Company, Limited (London), Jeal and Company, Limited (London), Lithanode Limited (London), Lucas, Joseph, Limited (Birmingham), New Peto and Radford Accumulator Company, Limited (London), Randall Brothers (London), Richford and Company, Limited (London), Rotax Motor Accessories Company, Limited (London), Rushmores, Limited (London), Sun Electrical Company, Limited (London), Surrey Electrical Company, Limited (London), C. A. Vandervell and Company, Limited (London), F. Wiggins and Sons (London).

BRADFORD TRAMWAY MANAGER'S RESIGNATION.

MR. C. J. SPENCER ACCEPTS A LONDON APPOINTMENT.

Mr. C. J. Spencer, general manager of the Bradford Corporation Tramways, has resigned that position, which he has held with notable success for the past twenty years, to take up an important executive appointment with the London Underground Railway group. As is well known, this includes the London United Tramways, an undertaking upon which some £400,000 will be expended after the war in the reconstruction of the permanent way, rolling stock, etc.

At a meeting of the Bradford Tramways Committee on July 29, the following letter from Mr. Spencer was read by the chairman, Alderman E. Priestley :—

Dear Mr. Chairman,—I beg to inform you that in consequence of having accepted a position with the London Underground Company, I must, with great regret, tender my resignation to yourself and the Tramways Committee, to take effect as from November 1 this year. I am sure that yourself and the committee will realise that I have not taken this step without the fullest consideration and thought.

I was appointed your tramways general manager in March, 1898, and have therefore been in your service over twenty years. I have seen the system grow from very small beginnings to one of very great magnitude. The first year of operation the receipts for the city tramways were £8,870. Last year the figure was close on £400,000, and it is estimated that the current year will result in revenue of close upon half a million. You will therefore realise that to break away from an organisation which has been my constant thought and care for twenty years is not a step to be lightly taken, and had it not been for the possibility of much wider activities, coupled with a very substantial financial inducement, that step would not have been taken.

May I take this opportunity of thanking you and the committee for your uniform kindness and courtesy through the many years of my office, and especially do I desire to thank you personally as my chairman for fourteen years, and prior to that deputy chairman, and even prior to that a member of the Tramways Committee? We have for all this period had common interests, and whilst at times we have had differences of opinion, they have never interfered with our good personal relations. I sincerely hope that the future of the Bradford tramways department and of the city generally will be everything that its well-wishers could desire. I shall always take a keen interest in your doings, and be pleased with your successes. Yours faithfully,

C. J. SPENCER, General Manager.

The resignation was accepted, and several members of the Tramway Committee expressed their sense of the value of Mr. Spencer's services and their regret that these should now be lost to Bradford. Mr. Spencer, who was born at Halifax in December, 1875, has been manager of the Bradford Tramways since 1898. He served his pupilage with the Blackpool Electric Tramways, one of the pioneers of electric traction, and later accepted an appointment with the South Staffordshire Tramways Company, whose electric tramways were opened in 1892. For over a year Mr. Spencer served with the Admiralty as assistant director (labour division) of the shipyard labour department, and on resigning the appointment owing to the pressure of his duties at Bradford, he received the cordial thanks of the Lords Commissioners of the Admiralty, who expressed to the Lord Mayor of Bradford "their high apprecation of the able and zealous manner" in which he had carried out the responsible work entrusted to him.

Mr. Spencer is widely known in municipal circles as the honorary secretary for many years of the Municipal Tramways Association, of which he was president in 1909-10. He will take up his duties in London on November 1.

COAL RATIONING FOR INDUSTRIES.

The Controller of Coal Mines is being assisted in the coal economy campaign, which he has instituted to reduce fuel consumption in every way possible, by a technical staff attached to the head office ; and arrangements have now been made for a large number of engineers in the country to attach themselves to the Coal Control Department for this special purpose. The arrangement enables the country to be mapped out in districts, so that all industrial consumers will, within a reasonable time, be in touch with the organisation.

The scheme comprises two main sections, namely, (1) electrical undertakings, and (2) industrial undertakings. The work involved includes the careful scrutiny of the quantity and quality of coal consumed by the various undertakings and the efficiency obtained, and the inspection of factories and works by experts to ascertain the best means by which fuel consumption may be reduced. A considerable amount of work has already been done, but it is intended to accelerate the rate of progress as much as circumstances will admit. Some 400 skilled engineers will shortly be at work in various parts of the British Isles. They are giving their services to the Government without delay.

Any public body, or company, or person wishing to effect economies at once, and desiring the Controller's assistance in this direction, is invited to communicate with Coal Control Headquarters, Room 309, Holborn Viaduct Hotel, London, E.C.1, when arrangements will be made to send a technical expert to look into the condition under which coal is being consumed, and to co-operate with the consumer in effecting economy. Apart from special applications of this kind, the Controller's representatives will visit firms in turn in accordance with a general plan of operations.

So imperative is the need to reduce coal consumption to a minimum that a rationing scheme for all industrial undertakings will be introduced shortly.

Digitized by Google

FINANCIAL REPORTS AND MEETINGS.

DIVIDENDS.

LIMA LIGHT, POWER AND TRAMWAYS.—A dividend of 10 per cent. is announced.

HADFIELDS.—An interim dividend of 1s. per share, free of tax, on the ordinary shares is announced.

CLONTARF AND HILL OF HOWTH TRAMROAD COMPANY.—An interim dividend of 3s. per share has been declared.

MATHER AND PLATT.—An interim dividend of 5 per cent., less tax, for the half year ended June last has been announced.

SAN PAULO TRAMWAY LIGHT AND POWER COMPANY, LIMITED.—A dividend of 2½ per cent. on the common stock has been declared.

LONDON GENERAL OMNIBUS COMPANY.—An interim dividend for the half year ended June 30 of 4 per cent., free of tax, on the ordinary shares has been declared.

LONDON ELECTRIC RAILWAY.—Dividends of 2 per cent. on the 4 per cent. preference stock and ¾ per cent. on the ordinary for the half year ended June 30 have been announced.

CENTRAL LONDON RAILWAY.—An interim dividend of 1¾ per cent. on the undivided ordinary shares and 2 per cent. on the preferred ordinary for the six months ended June 30 has been announced.

METROPOLITAN RAILWAY.—A dividend for the half year at the rate of 1 per cent. per annum on the ordinary stock and of 2¾ per cent. on the surplus land stock. The rates are the same as a year ago.

DUBLIN UNITED TRAMWAYS.—A dividend of 4 per cent. per annum, less tax, on ordinary stock for half year (interim), payable August 5, has been announced. Last year the dividend was the same.

METROPOLITAN DISTRICT RAILWAY.—Interim dividends of 2 per cent. on the guaranteed stock, 2¼ per cent. on the first preference and 1½ per cent. on the 5 per cent. second preference have been announced.

CITY AND SOUTH LONDON RAILWAY.—Interim dividends on the 5 per cent. preference stocks 1891, 1896, 1901 and 1903, of 2½ per cent. and on the consolidated ordinary stocks of ¾ per cent. have been declared.

STEWART AND LLOYDS.—An interim dividend for the half year ended June 30 last has been declared at the rate of 6 per cent. per annum on the preference shares and of 10 per cent. per annum on the preferred ordinary shares.

LIVERPOOL OVERHEAD RAILWAY COMPANY.—An interim dividend for the half year ended June 30 is announced at the rate of 5 per cent. per annum on the preference shares and 2½ per cent. on the ordinary shares. A year ago the rates were the same.

GLOUCESTER RAILWAY CARRIAGE AND WAGON COMPANY.—A dividend at the rate of 10 per cent. for the half year to May 31, making 10 per cent. for the year less income tax, and also a bonus of 5 per cent., free of income tax, have been announced.

UNDERGROUND ELECTRIC RAILWAYS.—Interest on the 6 per cent. first cumulative income debenture stock, payable August 31, less tax, at 3 per cent., and coupon No. 21 off the 6 per cent. income bonds, payable free of tax at 2 per cent. September 2, has been announced.

Walsall Corporation Tramways.—The net profit for the year ended May 25 amounted to £16,316, including the profits on the motor omnibuses.

Brown Bayley's Steel Works.—The directors recommend that a new Company be registered, with a capital of £800,000, divided into £300,000 ordinary shares and £500,000 preference shares, and that the shareholders in the old company be allotted four £5 ordinary shares for each old £10 share and two £5 ordinary shares for each old £5 share. The directors also propose to offer £300,000 5 per cent. cumulative preference shares to present proprietors and their friends for cash, the dividends to be free of tax. Treasury consent has been obtained to the issue.

New South Wales State Railways and Tramways.—The report for the quarter ended March 31 gives principal details as follows:—Railways—revenue £2,456,096, increase £164,649; expenditure £1,487,348, increase £91,662; number of passengers 25,269,940, increase 1,103,046; tonnage 3,155,469, decrease 33,914; lines open (miles), 4,580, increase 270½; percentage, expenditure to earnings, 60·56 per cent., decrease ·35 per cent. Tramways—revenue £563,937, increase £47,333; expenditure £395,539, increase £3,538; number of passengers, 71,083,908, decrease 5,165,963; percentage, expenditure to earnings, 70·14 per cent., decrease 5·74 per cent.

Gloucester Carriage and Wagon Company.—The report for the year ended May 31 states that profit, after making usual provision for depreciation, war dependants, contingencies and internal reserves, was £83,841, and the disposable balance, after deducting interim dividend, £113,609. The directors transfer £10,000 to reserve (making it £200,000), and recommend a dividend at 10 per cent. per annum, less tax, making 10 per cent. for the year, and a bonus of 5 per cent., free of tax, carrying £51,109 forward. The wagon repairing branch has, as at March 31, been transferred to Wagon Repairs, Limited. The assets, however, remain in the balance sheet in lieu of shares in Wagon Repairs, Limited, to be issued.

Bradford Corporation Tramways.—The accounts for a year just presented show that the traffic income amounted to £366,496, an increase of £40,090, representing 15·89d. per car-mile, compared with 13·67d. in the previous year. Traffic expenses amounted to £115,800, against £99,700, the principal item being increase of wages in the shape of war bonus, which amounted to £28,000. The war bonus (£47,000) considerably influenced the cost of maintenance and repairs, which showed a rise from £46,500 to £64,700, the maintenance of permanent way accounting for £8,600, and of cars for £9,600, of the increase. Allowances to dependants of employees who have joined the forces amounted to £22,200—an increase of £7,900. Apart from its feeding value to the remainder of the undertaking, the railless system showed a deficit of £2,760, as against £3,170. The gross profit amounts to £87,180, and after payment of interest and sinking fund there is a net profit of £31,376, compared with £30,802. After carrying forward the balance of the profit for the past year the reserve and renewals account now stands at £111,048.

Northampton Corporation Tramways.—The balance sheet for the year ended March 31 showed a net profit on the year of £3,235 2s. 8d., of which £1,625 is transferred to the reserve fund, and £1,610 2s. 8d. carried forward. In the year ended March 31, 1917, there was a deficit of £3,003 12s. 6d. The effect of the alterations in the fares is seen in the traffic receipts, which were £44,226 14s. 1d., against £36,953 in the previous year. Wages to motormen and conductors (apart from bonus) absorbed £6,434 5s. 11d., as against £6,434 11s. 3d. in the year ended March 31, 1917, £2,169 10s. 1d. was spent on repair and maintenance of the permanent way, as against £2,559 11s. 6d., and £3,500 in the upkeep of cars, as against £2,789 13s. 3d. Fuel cost nearly £1,000 more than in the preceding year—£5,445 0s. 7d., against £4,489 18s. 10d.; allowances to men who have joined the forces absorbed £1,811 15s. 4d., against £1,647 11s. 3d.; and war bonus £3,000 13s. 2d., as against £982 4s. 3d. On the Parcels Department the income was £438 18s. 10d., and the expenditure £322 4s. 11d. During the year 737,007 car-miles were run as against 748,271. The passengers carried numbered 10,753,042 as against 9,707,456; and the parcels dealt with were 43,131, as against 54,844.

Kilmarnock Tramways.—In his report for the year ended May 15, 1917, Mr. W. C. Bexon says that the gross profit was £1,151, as compared with £1,019 for the previous year. After paying interest and sinking fund, and allowing £1,160 for depreciation, the result is a net deficit of £3,163. The traffic receipts per car-mile are 9·228d., as against 7·726d. last year, but owing to the increased cost per car-mile, the final results are a little worse than last year. The operating costs of 8·073d. per car-mile cannot be considered high; in fact, they compare favourably with some other undertakings, but what is required to make the tramways a success is to get higher receipts per car-mile. The tramways system has not sufficient scope to be made a paying proposition, and in addition the ½d. fare is a real drawback to the scheme being a financial success. Practically the whole of the tramway undertakings in the British Isles—except two or three of the large cities—have had to dispense with ½d. fares. Mr. Bexon has occasionally suggested to the committee that the scheme should be revised, and that ½d. fares should be abolished altogether. When this is done he thinks the tramway results will prove more satisfactory. The track is in a very bad condition at present, and extensive repairs have been required owing to loose joints and corrugated rails. The permanent way will have to be completely overhauled when the war is over.

Keighley Corporation Tramways.—Mr. Harry Webber, the borough electric engineer and tramways manager, in his annual report, says that notwithstanding the heavy charges for war bonuses and allowances, there is a substantial net profit on the undertaking as a whole. The inauguration of the penny all-the-way fare has been a success. On the railed track the revenue has increased £2,042, but, per contra, the war allowances and bonuses have gone up by £683, and the other working expenses £53. The car-miles have dropped by 35,417, due to reduced evening service, and the passengers have fallen by 413,847, to 3,088,807. This decrease is more apparent than real, however, on account of one ticket now franking a passenger over the whole length. The receipts per car-mile have increased from 11·2d. to 15·8d. On the trackless trolley system a great deal of trouble has arisen through the difficulty of getting repairs to mechanism which was made in Austria before the war. In spite of increased revenue, this part of the system has resulted in a loss of £457, and as soon as possible a further increase in the fares will have to be adopted. The car-miles have dropped from 73,277 to 57,158, but the return has been 19·6d. per car-mile as against 14·1d. The gross profit for the year has been £3,178, and after providing for interest and sinking fund there is left a net surplus of £1,211. It is proposed to pay out of this debts on the trackless undertaking of £762, and on the tramways of £279, and to carry the balance of £170 to reserve fund. Parliamentary sanction to increased war-time fares is looked forward to.

Digitized by Google

BURNLEY CORPORATION TRAMWAYS.

In his 17th annual report covering the year ended March 31 last, Mr. Henry Mozley, general manager, Burnley Corporation Tramways, says that considering the effect of war conditions and the strikes which occurred during the year the results were not unsatisfactory. A strike in July, which lasted eight days, caused a loss of £2,600 in traffic receipts and £1,300 in net receipts. This strike was the first experienced in Burnley, and was caused by differences between two trade unions and was ultimately referred to arbitration. Another strike in November, of fitters, turners, etc., affecting two local organisations on the question of 12½ per cent. war bonus, lasted four days, and entailed an estimated loss in traffic receipts of £60. A third strike took place on Christmas Day at the order of the Amalgamated Association of Tramway and Vehicle Workers, when no cars were run, and the loss caused thus amounted to £400 in traffic receipts, and £293 in net receipts. Notwithstanding these losses the net receipts for the year were £6,389 1s. 6d., an increase of £1,166 15s. 10d. The total revenue from traffic was £96,967, an increase of £9,928. Owing to additions to wages by war bonuses and the enhanced cost of material, working expenses increased heavily and amounted to £70,195 as compared with £61,815 in the previous year. The average working expenses per car-mile were 10·64d., an increase of 1·56d., which was due to higher charges for energy made by the Electricity Committee, and to less experienced drivers. The following is a brief summary of the results for the year compared with four previous years :—

Year ended March 31.	1918.	1917.	1916.	1915.	1914.
	£	£	£	£	£
Total revenue	97,480	87,421	83,238	78,466	88,316
Working expenses	68,203	58,604	53,572	55,833	62,948
War allowances	1,993	3,211	4,312	2,483	—
Profit on working	27,284	25,606	25,354	20,150	25,368
Interest	6,590	6,401	6,552	6,797	6,939
Sinking fund	8,941	8,716	8,497	8,284	7,728
Rent for tramways worked	1,546	1,546	1,752	1,889	1,941
Income tax on profits .	3,818	3,720	2,541	1,515	1,072
Reserve fund	6,389	5,222	—	—	—
Borough fund	—	—	6,010	1,664	7,687
Passengers carried	17,796,016	17,068,753	16,964,677	15,867,699	17,668,834
Fare per passenger ... *d.*	1·31	1·21	1·15	1·16	1·18
Car-mileage	1,538,471	1,548,902	1,546,389	1,644,712	1,754,811
Units per car-mile	2·28	2·15	2·16	2·20	2·22
Power cost per car-mile *d.*	3·022	2·786	2·657	2·620	2·74
Traffic receipts per car-mile	15·13d.	13·48d.	12·88d.	11·42d.	12·04d.
Expenses per car-mile ...	10·64d.	9·08d.	8·31d.	8·15d.	8·62d.
Ratio of expenses	70·34%	67·04%	64·36%	71·16%	71·37%
Number of cars in stock ...	67	67	67	67	67

BRIGHTON CORPORATION TRAMWAYS.

The annual report of the engineer and manager of the Brighton Corporation Tramways, Mr. William Marsh, for the year ended March 31, has been issued. The financial results are very satisfactory. All previous records have been broken, and the number of passengers carried was nearly half as many again as was the case three years ago. The remarkable growth of the undertaking is shown in the following summary :—

Year ended March 31.	1918.	1917.	1916.	1915.
	£	£	£	£
Traffic revenue	77,916	62,527	55,871	54,413
Miscellaneous revenue	2,306	2,292	2,065	2,113
Total revenue	80,222	64,819	57,936	56,526
Working expenses	48,398	41,498	41,001	42,985
Surplus on working	31,824	23,321	16,935	13,541
Bank interest	391	134	38	55
Total gross profit	32,215	23,455	16,973	13,596
Interest on capital	7,301	7,345	7,348	7,661
Sinking fund	6,195	6,432	6,429	5,917
Income tax...	2,041	1,644	965	*491
Revenue contribution to capital outlay	1,250	513	—	—
Net balance	15,428	7,521	2,231	18
	32,215	23,455	16,973	13,596
Car-miles run	1,152,006	1,131,201	1,053,285	1,108,352
Passengers carried...	16,942,512	13,678,251	12,295,198	11,837,828
Number of units used	1,907,537	1,837,629	1,678,627	1,676,770
Units per car-mile	1·65	1·62	1·59	1·51
Average traffic revenue per car-mile ...	16·23d.	13·26d.	12·73d.	11·78d.
Average traffic revenue per mile of single track	£4,532	£3,637	£3,191	£3,165
Average total revenue per car-mile ...	16·71d.	13·75d.	13·202d.	12·24d.
Percentage of working expenses to receipts	57·25	58·56	64·14	72·79
Average working expenses per car-mile (excluding power)	7·17d.	5·78d.	6·35d.	7·10d.
Average working expenses per car-mile (including power)	9·56d.	8·05d.	8·47d.	8·91d.
Average car miles per day per car ...	83·92	88·56	77·76	76·08
Average journeys per head of population per annum	126·5	102·13	91·8	88·38

* Included in working expenses.

The capital charges on the loan for the Act of 1912 have now been met, but the saving in this respect is far more than counterbalanced by the increase in income tax. The total revenue shows an increase on the year of 23·76 per cent., while the working expenses, including war dependants' separation allowances, have increased by 16·63 per cent. The passengers carried amounted to nearly 17 millions, an increase of nearly 3,600,000. Mr. Marsh remarks that although the undertaking may be apparently prospering, the conditions are abnormal, and in view of the future, fares should certainly be increased, and other steps taken permanently to increase the revenue. Repairs and renewals have been reduced as much as practicable, and the postponement of track renewals is mounting up steadily. Just previous to the war, thorough reconstruction of the track had taken place, and the benefit of the good workmanship then put in is now being felt. In concluding his report, Mr. Marsh says that one outstanding point is the greatly increased expenditure which is bound to come as an aftermath of the war, and no time should be lost in taking the necessary steps to provide for it. Another item of importance is the steadily accumulating arrears of renewals, while insufficient provision is being made to pay for them. Allowing for an increase of 50 per cent. in the cost of track renewals, the undertaking cannot be said to be making sufficient allowance until at least £12,500 per annum is being set aside, with arrears up to date.

SHEFFIELD CORPORATION TRAMWAYS.

The report for the year ended March 25, 1918, shows that £14,128 was expended during the year on capital account, and that the total capital expenditure now stands at £1,230,495. The revenue account, which is summarised below, reveals a gross profit of £176,679. The motor omnibus section provided a net balance on the year's working of £4,041, and this sum has been transferred to the special reserve fund. A further increase of 5 per cent. was made on December 25, 1917, in the price charged for electrical energy and from June, 1918, another advance of 8⅓ per cent. came into operation, making a total increase of 33⅓ per cent. on the pre-war figures.

On May 12, 1917, the ½d. fare stages for adult passengers were discontinued on all routes. During the year a settlement was arrived at with the Income Tax Commissioners with respect to the income tax account for the tramway undertaking covering the period from 1900-1 to 1913-14 inclusive. This settlement gave a total net relief of £16,169 for the period referred to and of this sum an amount of £10,799 has been paid into the tramways renewal fund, the remaining balance of £5,389 being transferred to the relief of the General District Rate.

	1918.	1917.	1916.	1915.
Income—	£	£	£	£
Traffic revenue	595,159	519,281	449,946	391,535
Sundry receipts	6,286	6,404	5,663	4,341
Total income	601,445	525,685	455,609	395,876
Expenditure—				
Traffic expenses	189,618	155,088	132,399	120,296
General expenses	30,410	27,905	25,460	26,077
Repairs account	99,069	68,483	47,796	45,385
Power expenses	94,632	84,290	65,284	49,365
Total working expenses ...	413,729	335,766	270,939	241,123
War allowances	11,037	11,849	11,210	5,707
	424,766	347,615	282,149	246,830
Gross profit	176,679	178,070	173,460	149,044
Interest and sinking fund ...	65,436	64,742	63,818	73,540
Income tax on profits	27,339	24,850	13,862	5,567
Street improvements	8,425	8,381	8,159	7,882
Renewals fund	36,036	34,698	30,115	30,018
Surplus fund	903	1,180	8,049	7,163
Special purposes fund	2,000	2,946	2,000	2,000
Grant to Sheffield University...	—	—	5,000	—
On capital account	417	1,175	601	—
Relief of rates	36,122	40,098	41,856	22,876
Mileage of track	79	79	79	79
Passengers carried	153,506,213	142,551,547	123,429,410	107,023,195
Fare per passenger	·930d.	·876d.	·878d.	·878d.
Car-mileage	9,761,994	9,662,012	8,867,726	8,810,252
Units per car-mile	2·378	2·327	2·172	1·979
*Power cost per car-mile ...	2·327d.	2·094d.	1·767d.	1·345d.
*Traffic receipts per car-mile ...	14·632d.	12·899d.	12·176d.	10·664d.
*Expenses per car-mile ...	10·172d.	8·340d.	7·333d.	6·568d.
*Ratio of expenses	69·489%	64·451%	59·926%	61·116%
Number of cars in stock ...	347	349	339	339

*Excluding war allowances.

GOVERNMENT TO PURCHASE BRISBANE TRAMWAYS.

The Queensland Government have decided to reintroduce the two bills for the purchase and working of the undertaking of the Brisbane Electric Tramways Company. These bills provide for compulsory reduction in fares so that the profits of the company shall be restricted to not more than 5 per cent. on the value of the tramways. The undertaking is subject to purchase by the Government after September 20, 1920 (under the Act of 1882), and according to legal opinion the purchase terms must be arrived at on the basis of the commercial value of the undertaking as a going concern, the profits being the basis of the valuation. If the fares, and consequently the profits, are reduced meanwhile, the value of the property will be so much less when the time arrives for the Government to purchase the undertaking.

Digitized by Google

PERSONAL.

Mr. F. Harding, manager of Derby Corporation Tramways, has been granted an increase in salary from £380 to £430.

Mr. L. P. Wilmhurst, electrical engineer of Derby Corporation, has been granted an increase in salary from £730 to £950.

Mr. T. H. Hobson has been appointed a representative of the London County Council on the Electrical Conciliation Board.

Mr. A. Williams, charge engineer, has been appointed cable and station superintendent of the South Lancashire Tramways.

Mr. Stanley Clegg, electrical engineer and tramways manager, of Lincoln, has been granted an increase in salary of £250 a year.

Mr. W. J. Roycroft has been elected chairman of the new Committee of Management of the Schull and Skibbereen Tramway.

Captain Barker has been appointed by Burnley Town Council consulting engineer at the electricity works for the remainder of the war.

Mr. William R. Anderson, cable and station superintendent, has been appointed resident engineer of the South Lancashire Tramways Company.

Mr. G. F. Craven, general manager of the Reading Corporation Tramways, has been appointed Local Fuel Overseer for the borough of Reading.

Mr. H. H. Gordon has resigned his membership of the Electrical Conciliation Board of the London County Council, owing to having joined H.M. Forces.

Mr. H. Vorley, accountant in the London County Council Tramways Department, has been granted a sum of £60 as extra duty pay in recognition of special services rendered during 1917.

Mr. Sidney F. James, town clerk of Ilkeston and honorary solicitor to the Municipal Tramways Association (Incorporated), has been appointed secretary to the Tramways (Board of Trade) Committee, whose offices are at Buckingham Gate, S.W.1.

Mr. Hopkin Morgan, electrical engineer of the Port Talbot Railway and Docks Company, has been appointed district engineer for the purpose of conducting inquiries on behalf of the Coal Mines Department in connection with the economical use of coal.

Mr. R. Stuart Pilcher, general manager of Aberdeen Corporation Tramways, has been appointed general manager of Edinburgh Corporation Tramways at a salary of £1,000 per annum. Further particulars of the appointment are given in another column.

Mr. J. D. R. Cox, general manager of the Edinburgh and District Tramways Company, has been appointed by the Board of Trade Coal Management Department as district engineer in connection with the coal economy campaign. He will still continue his duties as manager of the tramways.

Glasgow Tramway Committee's proposals for increases in the salaries of several officers have been approved. The increases are as follow:—Mr. J. Dalrymple, general manager, from £1,300 to £1,500 per annum; Mr. L. Mackinnon, traffic superintendent, £700 to £750; Mr. J. Ferguson, chief engineer, £700 to £750.

Mr. William B. McCombe, eldest son of Mr. W. J. McCombe, manager of Hull Corporation Tramways, has won a classical exhibition at Worcester College, Oxford, from Hymers College, where he is senior prefect, cricket and football captain, and cadet officer of the O.T.C., in addition to being the editor of the "Hymerian," the college magazine.

We regret to record the death of **Mr. T. Hayes,** resident engineer of the South Lancashire Tramways Company. He had been connected with the company for the past fourteen years.

The death has occurred in Berlin of **Herr Arnold von Siemens,** at the age of 65 years. The deceased was the eldest son of the late Werner von Siemens, and a director of the Siemens and Halske Company, and of the Siemens-Schuckertwerke.

INDUSTRIAL RECONSTRUCTION LECTURES.

The Industrial Reconstruction Council has arranged for an important series of lectures for the autumn and winter. The first of these will be given by the President of the Board of Trade (Sir Albert Stanley, M.P.) on Wednesday, October 2, Mr. G. N. Barnes, M.P., occupying the chair. Other lectures will follow at fortnightly intervals, the second being delivered by the Minister of Reconstruction (Dr. Addison, M.P.), under the chairmanship of the Lord Mayor. Mr. W. L. Hichens, Sir Arthur Steel-Maitland, Bart., M.P., Mr. Ernest J. P. Benn, and Sir William S. McCormick will carry the series up to Christmas, the chair being occupied by Sir Wilfred Stokes, Lord Burnham, Mr. J. H. Whitley, M.P., and the Marquess of Salisbury. The lectures will be given at the Saddlers' Hall, Cheapside, at 4.30 p.m. A full prospectus of the series can be obtained from the Secretary, I.R.C., 2 and 4, Tudor Street, E.C.4.

TRAMWAY AND LIGHT RAILWAY NOTES.

ABERDEEN.

A Food Delivery Service.

The Corporation Tramways Committee proposes to extend the present facilities for carrying parcels to include the delivery of bread and meat from shops by means of messengers who would leave the cars at certain points.

BRADFORD.

Night Carriage of Goods.

The Corporation Tramways Committee is considering the possibility of using the tramway system for the carriage of goods at night.

CROYDON.

Sunday Service Resumed.

The Sunday morning tramway service has been re-started. There had been much complaint of the absence of the service during a few weeks, and the management therefore decided to resume it.

DARLINGTON.

Results of Increased Fares.

On the increase of the fares on the Corporation Tramways the number of passengers carried fell from 112,851 to under 96,000 in the first week, but rose by about 2,000 per week in each of the two following weeks. The increases in the takings were approximately £8 to £21 for the three weeks.

DONCASTER.

Reduction of Services.

The Town Council has considerably reduced the tramway service. The action has been forced upon them by the Board of Trade in order to economise in the consumption of coal, and it is anticipated there will have to be further reductions in the service.

GATESHEAD.

Reduction of Stopping Places.

The Gateshead and District Tramways Company has considerably reduced the number of stopping places.

GLASGOW.

Earlier Stoppage—Compensation for the Corporation.

It is proposed to curtail the Glasgow tramway service by about an hour in the evening owing to about a hundred motormen being called up for military service. The Corporation has obtained £130 damages and expenses in settlement of an action against the owners of a steam wagon which ran into and damaged one of the Corporation's tramway cars.

HANLEY.

Protest against Women as Drivers.

The North Staffordshire Trades and Labour Council has protested against the proposed introduction of women tramcar drivers in the Potteries district. The grounds of the protest may be summarised as (1) sufficiency of discharged soldiers and sailors; (2) strain of the work; (3) cheapening of labour.

HULL.

Objection to Women as Drivers.

Hull tramway men are strongly opposed to the introduction of women drivers, and they are supporting the appeals of all motormen called up for service. The secretary of the Tramwaymen's Union recently supported the application of the Grade 2 men for exemption before the local Tribunal. He stated that three hundred men had joined the colours, and desired that the remainder should be retained in order to avoid the necessity of employing women drivers. The application was refused.

LEEDS.

Damages against Corporation—Prospective Extensions.

An action for damages at the Leeds Assizes resulted in an award of £250 against the Leeds Corporation. The plaintiff, a woman in business as a carrier, was driving a motor wagon. A tramcar collided with it, and plaintiff was thrown off and sustained considerable injuries, and claimed chiefly for loss of business. The defence was that plaintiff was negligent. A counter claim for five guineas for damage to the tramcar was dismissed. In connection with a proposal to apply for Parliamentary powers to enable Leeds Corporation to acquire land from the Middleton Estate and Colliery Company for the purposes of a garden suburb for the working classes, the company will give the land and ballast for the construction of a tramway or light railway from the city. It is also proposed to incorporate the township of Middleton within the city.

LIVERPOOL.

Tramway Workers' Strike.

A strike of a section of Liverpool Corporation tramway employees which lasted only four days caused much inconvenience to the general public, and several disorderly scenes resulted from the action of strike pickets interfering with employees who preferred to remain at work. The strike was engineered by the Municipal Employees' Association, an organisation which is not recognised by the Trades Union Congress, and a programme of demands issued by the strikers'

Digitized by Google

committee included recognition of this association by the Tramways Committee. On the fourth day of the strike a settlement was arrived at. The strikers agreed to resume work forthwith pending arbitration, with the proviso that they should be reinstated, and the Tramways Committee undertook that the manager or deputy manager would receive any official of the association with respect to any *bona-fide* complaint.

LONDON.

OBSTRUCTORS FINED—DEFECTIVE TRAMWAY LINES—CAR OVERTURNED.

Fines of 40s. with costs were imposed at a police court recently on each of two defendants for being the owners of vehicles which, owing to their defective condition, broke down and caused an obstruction to the traffic on the London County Council Tramways. Accidental death caused by defective tramway lines was the verdict at a coroner's inquest upon a woman who was a passenger inside a motor omnibus when a motor lorry going in the opposite direction got beyond the control of the driver and came into collision with the omnibus. A London County Council tramcar passing from Blackfriars Bridge overturned on the Victoria Embankment. There were about seven or eight passengers on the car. Two were removed to hospital. Others suffered from contusions and shocks. Neither the driver nor the conductor was hurt. An electric standard was broken. Soon after the car overturned flames shot up from the conduit, but the fire soon ceased on the application of sand.

MANSFIELD.

LIFE-GUARD COULD NOT ACT.

At an inquest upon a three-year-old child, it was stated that the deceased ran to cross the road in front of a tramcar and fell between the gate and the life-guard, so that the life-guard could not drop. The car was being driven by a man, aged 28, a learner, who was being instructed by a woman, who had been tramcar driving for two years. A suggestion was made that at the moment of the accident a biscuit was being handed from one to the other, but this was denied. The woman said that had she been driving she might have been able to prevent the accident. The jury returned a verdict of "Accidental death."

ROTHERHAM.

THE PURCHASE OF MEXBOROUGH AND SWINTON TRAMWAYS.

Sir John Snell, in giving evidence in support of the Bill of Rotherham Corporation, said that he considered £45,000 a reasonable price for the purchase of the Mexborough and Swinton electric tramways undertaking. At least £15,000 would be obtained by the sale of plant which the Corporation would not require. Rotherham would be able to supply electricity at a much cheaper rate than the Tramway Company could possibly obtain it, and they might look for an immediate revenue of £31,000 a year.

SCARBOROUGH.

FACILITIES FOR FISH DISTRIBUTION.

The Scarborough Tramways Company proposes to carry fish on the tramways from the piers to the goods station, and to seek assistance from the Government towards the cost of laying the additional track.

SHEFFIELD.

AUXILIARY DRIVERS.

At a meeting of the Sheffield Tramway and Vehicle Workers' Association the opinion was expressed that some of the auxiliary drivers were coming to tramway work in order to evade military service, and it was resolved to request the management to employ no men in Grade I. as auxiliary drivers.

CONTRACTS AND ORDERS.

Southend Light Railways Committee have ordered an electric welding plant from Scott Anderson.

Glasgow Tramways Committee have placed a contract with Hadfields, Limited, for special work.

The Vacuum Oil Company are supplying 700 gallons of transformer oil to Walsall Electricity Department.

Bradford Corporation have accepted a tender from C. A. Parsons and Company for a 12,000-KW. turbo-generator.

The British Westinghouse Company have an order from Belfast Electricity Committee for a 1,000-KW. transformer at £1,305.

Belfast Electricity Committee have placed a contract for the supply of cables with Callender's Cable and Construction Company.

Salford Tramways Committee have ordered from Hadfields, Limited, four pairs of manganese points and twelve manganese crossings at £695.

British Westinghouse Electric and Manufacturing Company's tender have been accepted by Newcastle-under-Lyme Corporation for a 150-K.W. rotary converter with high and low tension switch for £2,160 15s.

STANDARD TRAMWAY RAIL FOR AUSTRALIA.

A meeting of Australian electric tramway engineers convened in Sydney, N.S.W., to consider the adoption of a standard grooved girder tramway rail, passed the following resolutions :—

1. That a standard girder rail be adopted for the tramways of the various States of the Commonwealth.
2. The weight of the girder rail for the tangent track shall not be less than 90 lb. per lineal yard, the exact weight being subordinated to the design.
3. That the height of the girder rail be not less than 6 in.
4. That the width of the flange shall not exceed the height of rail by more than ½ in.
5. That the conference is agreed that the form of groove and guard of the rail should take the form of the present standard of the American Electric Railway Association.
6. That the tread of the proposed section of rail shall approximately conform to that shown in blue print No. 3365 of the Adelaide Municipal Tramways Trust.
7. That Mr. Cowdery, engineer for permanent way, New South Wales Government Tramways, be asked to get from the manufacturers the chemical and physical tests of steel that they can guarantee for tramway purposes, and that it be left to him to design a rail in conformity with the resolutions of the conference.

The tread referred to in Resolution 6 is struck to a radius of 12 in., with a 5-16 in. radius on the running edge, which the conference resolved would tend to give a longer life both of wheels and rails.

Owing to the difficulty of importing rails from overseas, the manufacture of rails in Australia has become necessary, and the Broken Hill Proprietary Company, Limited, which has steel works and rolling mills at Newcastle, N.S.W., proposes to instal a plant to roll grooved girder rails of the standard section.

ELECTRICITY SUPPLY.

GOVERNMENT INTENTIONS STILL UNCERTAIN.

Before the adjournment of the House of Commons, Colonel W. Thorne asked the President of the Board of Trade if any statement could be made as to the intentions of the Government with regard to the Report on Electricity Supplies ; if he was aware that the uncertainty at the present time of the Government's intentions was embarrassing to public bodies owning electricity undertakings, and that it was difficult for the local bodies to determine the proper course of action in regard to the extension of their plant and negotiations with their large consumers ; and if he intends taking action in the matter ? Sir A. Stanley, in reply, said the report was receiving careful consideration, but he regretted that he was not yet in a position to make any statement as to the intentions of the Government in regard to it.

PATENT LIST.

Abstracted for "The Tramway and Railway World" from the Official Journal of Patents.

***** If the inventions have been communicated the names of the communicators are given in italics.**

APPLICATIONS FOR LETTERS PATENT.

Rear axle structures for motor vehicles (10,786)—Albion Motor Car Company, T. B. Murray, and G. Pate.
Road wheels of automobiles (10,952)—F. W. Baker.
Variable speed mechanism (10,956)—Barr and Stroud, Limited, and J. W. French.
Differential gearing (11,134)—Brown-Lipe-Chapin Company and D. D. Ormsby.
Spraying apparatus for use on automobiles for laying dust raised (10,842)—H. A. Bull and J. A. Vanrossum.
De-rails (11,127)—S. W. Hayes.
Steering mechanism for road vehicles (11,001)—R. C. W. Horsley.
Motor vehicles (11,131)—P. G. Hugh and Scammel and Nephew.
Spring mechanism for motor lorries (11,132)—P. G. Hugh and others.
Brake mechanism for motor lorries (11,133)—P. G. Hugh and others.
Change speed gear for motor vehicles (11,141)—P. G. Hugh and others.
Mechanism for brakes of motor vehicles (11,142)—P. G. Hugh and others.
Change speed gear mechanism (10,903)—G. Mansell (*H. J. Mansell*).
Control of electrically-propelled trucks, etc. (10,857)—P. A. H. Mossay.
Electrically-propelled trucks (10,858)—P. A. H. Mossay.
Electrically-propelled vehicles (10,859)—P. A. H. Mossay.
Resilient wheel composed of flat circular spring spokes for motor vehicles (10,950)—J. F. Tallis.
Automobile conversion mechanism (11,071)—H. R. Williams.
Lubricators or oil cups (11,268)—S. Akeroyd and J. W. Senior.

Digitized by Google

STEAM AND HYDRAULIC
ENGINE PACKING
MANUFACTURERS
(Flax, Asbestos and Cotton)
And all Engine Room Stores
ATTWATER & SONS
Hopwood Street Mills, PRESTON
Telegraphic Address: "Attwaters, Preston."

STEAM CONDENSING PLANT.
VACUUM PUMPS AND EVAPORATORS.
MIRRLEES WATSON
THE MIRRLEES WATSON CO. LTD., GLASGOW

PROTECTION!
from danger to life and limb is fully secured by the use of "Triplex" Safety Glass. Cannot possibly splinter. A vital necessity for every purpose—Aeroplanes, Automobiles, Ships, Trams, Trains &c.
Catalogue mailed on request.
The Triplex Safety Glass Co. Ltd.
(REGINALD DELPECH, Managing Director)
1 Albemarle St., London W.1.
Contractors to H.M. Government.
TRIPLEX SAFETY GLASS

TROLLEY HEAD SLINGS
Trolley Head Slings 18" long by 3/16" diameter. Best Flexible Steel Wire Rope Galvanised, Loop-spliced in each end to take ½" bolt, and served with Galvanised Wire. Price 12/- per dozen nett (in Gross Lots). Sample on Application.
C. OSBORNE 97 South Street, Longsight, MANCHESTER

COPIES OF "THE TRAMWAY AND RAILWAY WORLD."
Wanted No. 1, Volume XXXIX. (January 1, 1916), to complete files for binding.
Also copies of indices to Volumes XI. (January to June, 1902). XIII. (January to June, 1903), and XXXVII. (January to June, 1915).
THE TRAMWAY AND RAILWAY WORLD,
Amberley House, Norfolk Street, London, W.C.2.

Electric Tramcar Handbook
FOR
MOTORMEN, INSPECTORS, AND DEPOT WORKERS.
By W. A. AGNEW.
120 Pages, 7 in. by 4½ in. Cloth. Price 1s. 6d. Postage 2d.
Copies can be obtained from THE TRAMWAY AND RAILWAY WORLD Offices, Amberley House, Norfolk Street, W.C.2

Electric locomotives or cars (11,444 and 11,573)—British Thomson-Houston Company (*General Electric Company*).
Tramway, etc., rails (11,201)—S. Butler.
Vehicle lifting jack (11,315)—M. P. Jackline.
Lifting jacks (11,274)—C. F. L. King.
Heavy mechanically-propelled vehicles (11,195)—Sir A. G. H. W. Moore and W. G. Wilson.
Springing of motor road vehicles (11,188)—A. W. Smyth.
Apparatus for indicating speed of vehicles (11,418)—J. B. Tucker.
Couplings for electrical conductors (11,279)—H. Williams.
Traction couplings (11,585)—M. Barker.
Self-propelled vehicles (11,859)—British Westinghouse Electric and Manufacturing Company and H. Mensforth.
Trolley heads for electric traction (11,779)—F. Haigh, W. Pickersgill and J. H. Vitt.
Speed indicators (11,853)—A. P. Japy.
Shock absorber for train transmission or shaft drive of motor cars (11,793)—J. B. Merry.
Bodies of motor vehicles 11,816)—W. Ivey-Rogers.
Trolley retriever (12,246)—B. P. Allen.
Car couplings (12,158)—R. K. Anderson.
Automatic stopping place indicator for tramway cars (12,196)—E. Bennett and A. Briggs.
Trolley heads (12,021)—S. Butler.
Insulators for supporting electric conductors on transmission lines (12,201)—Callender's Cable and Construction Company and C. W. Kay.
Power or drive transmission mechanism in motor vehicles (12,072)—A. J. Henderson.
Apparatus for electrically controlling air brakes (12,086)—W. J. Mellersh-Jackson (*Waterhouse and Prince*).
Receptacles for storage of compressed gas for motor vehicles (12,055)—G. P. Ottino.
Means for steering or controlling motor vehicles (11,956)—F. L. Rapson.

Specifications Published.

1916.

Variable speed and reversing gearing (16,083—*104,161*)—W. Morrison.

1917.

Motor car radiator caps (5,331—*116,310*)—L. Callender and A. Callender.
Braking and steering devices for motor vehicles (8,131—*116,345*)—J. Cox.
Spring suspension mechanism of motor vehicles (8,239—*116,358*)—Birmingham and Midland Counties Transport Company and G. E. D. Ralls.
Life-guard for motor vehicles (10,143—*116,389*)—J. Stokes.
Variable speed transmission gear (10,406—*116,394*)—F. Molyneux.
Electro-pneumatic braking systems (12,727—*115,016*)—W. V. Turner.
Life-guards for tramway vehicles (12,759—*116,420*)—J. Worsnop and others.
Carburetters for automobile engines (14,291—*110,548*)—Soc. Lorraine des Anciens Etablissements de Dietrich et Cie de Luneville.
Variable speed gear (16,316—*116,456*)—B. A. Malkin.
Railway or tramway sleepers and chairs (17,696—*116,461*)—S. P. Keates.
Apparatus for operating railway and like points by wire (19,237—*116,466*)—E. I. M. Vincent, J. Servais and Tyer and Company.
Motor car bodies (8,267—*116,527*)—G. Roesch and C. Talbot, Limited.
Driving apparatus for motor lorries (8,483—*116,537*)—J. T. Roberts and L. Johnson.
Combined carburetter control mechanism and air admission means for engines of motor vehicles (9,091—*116,565*)—R. W. Maudslay and Standard Motor Company.
Railway sleepers (16,351—*116,640*)—W. H. Meyrick.
Gas generators for use in the propulsion of automobile vehicles (8,609—*116,746*)—J. W. Parker and E. G. Abrahams.
Motor car chassis and other parts (8,644—*114,136*)—C. L. Heyermans.
Steer mechanism for motor vehicles (8,823—*114,293*)—C. H. A. Edye and C. L. Heyermans.
Change speed gear and clutches specially applicable for motor vehicle engines (8,969—*116,917*)—H. Lindblom.
Lifting jacks for pneumatic tired motor cars (9,770—*116,948*)—J. R. Watson.
Lifting jacks (14,173—*116,995*)—F. L. Rapson.
Speed indicators or tachometers (9,430—*116,937*)—W. Chadburn and W. R. Chadburn.

1918.

Variable speed gear (2,212—*116,476*)—T. S. Wilson and S. C. Bone.
Combined safety guard and brake for the front wheels of motor road vehicles (1,953—*116,669*)—W. H. Puttergill.
Rails for tramways and railways (2,185—*116,864*)—W. H. Jenkins.
Driving gear for electric locomotives (1,124—*114,417*)—Akt.-Ges. Brown, Boveri & Cie.

Digitized by Google

TRAFFIC RETURNS.

Tramway and Omnibus Undertakings in the United Kingdom.

NAME OF COMPANY OR CORPORATION.	1917. WEEKS ENDED.					1918. WEEKS ENDED.					AGGREGATE.		
	July 7.	July 14.	July 21.	July 28.		July 6.	July 13.	July 20.	July 27.		Wks.	1918.	Increase or Decrease.
	£	£	£	£	£	£	£	£	£	£		£	£
Aberdare U.D. Council	415	462	450	484	...	491	495	444	456	...	16	8,121	—
Aberdeen Corporation	2,293	2,144	2,535	2,320	...	2,746	2,555	2,942	3,871	...	8	20,818	+ 3,051
Ayr Corporation	595	724	1,382	823	...	723	874	1,801	1,055	...	10	8,142	+ 1,747
Belfast City	6,558	...	...	...	...	7,619	...	...	...	...	14	105,902	+ 20,906
Birkenhead Corporation	1,955	1,909	1,930	1,955	...	2,301	2,150	2,286	2,323	...	17	36,607	+ 6,059
Blackburn Corporation	1,618	1,616	1,656	1,676	...	1,858	1,738	1,945	1,844	...	17½	31,492	— 5,605
Bradford Corporation	8,098	7,995	8,067	8,256	...	9,726	10,137	9,310	9,694	...	17	148,804	- 18,826
Burnley Corporation...	1,978	1,714	250	1,285	...	2,253	2,373	2,309	2,270	...	—	—	—
Burton-on-Trent Corporation ...	306	307	374	322	...	409	407	437	436	...	17	6,854	+ 1,874
Bury Corporation	1,982	1,697	1,766	1,763	...	2,320	2,028	2,094	2,149	...	17	34,687	+ 5,953
Chatham and District	1,416	1,370	1,518	1,547	...	1,444	1,378	1,347	1,395	...	30	36,938	- 534
Cork Electric	671	637	647	680	...	756	692	628	639	...	30	18,375	+ 2,631
Derby Corporation	1,227	1,218	1,258	1,291	...	1,486	1,483	1,569	1,552	...	17	25,351	+ 5,394
Dundee City	1,558	1,530	1,658	1,838	...	1,942	1,866	2,068	2,088	...	10	19,556	+ 3,837
East Ham Corporation	1,428	1,348	1,408	1,483	...	1,563	1,542	1,516	1,589	...	16⅝	24,787	+ 776
Glasgow Corporation	27,144	26,831	21,692	24,041	...	29,443	27,599	23,784	25,962	...	8½	232,605	+ 18,834
Glossop (Urban Elec. Supply Co.)...	170	169	168	174	...	178	167	171	179	...	30	5,435	+ 1,135
Halifax Corporation	2,689	2,662	2,640	2,669	...	2,760	2,687	2,553	2,612	...	16⅝	44,156	+ 3,290
Halifax Corp. Motor Omnibuses ...	48	46	51	54	...	61	61	60	64	...	16⅞	999	+ 260
Huddersfield Corporation	3,536	3,399	3,330	3,609	...	3,550	3,639	3,549	3,729	...	17	62,280	+ 4,760
Ilford U.D. Council	809	753	796	837	...	1,074	1,024	952	1,034	...	17	16,868	- 4,089
Ipswich Corporation	735	685	783	833	...	797	802	774	861	...	17	12,662	+ 1,784
Isle of Thanet	377	363	376	422	...	350	371	360	410	...	43	9,498	— 2,757
Kilmarnock Corporation	215	196	227	247	...	240	243	297	308	...	10⅜	2,597	+ 521
Lanarkshire	3,139	2,902	3,907	3,096	...	3,958	3,618	4,885	3,722	...	30	103,911	+ 23,996
Lancashire United	3,331	3,173	2,521	2,768	...	3,587	3,236	2,945	2,944	...	30	84,325	+ 19,974
Leeds City	11,835	11,506	11,256	11,764	...	14,195	14,081	14,105	14,126	...	17	215,724	+ 31,068
Leicester Corporation	3,850	3,766	3,871	3,938	...	4,652	4,632	4,541	4,678	...	—	—	—
Leyton U.D. Council	1,934	1,848	1,935	2,000	...	2,532	2,478	2,300	2,438	...	17	36,905	+ 4,555
Liverpool Corporation	17,375	17,143	16,589	17,251	...	19,885	15,801	18,401	19,027	...	29½	495,508	- 73,257
Llandudno and Colwyn Bay ...	433	475	524	560	...	647	617	741	723	...	34	12,507	- 3,268
London County Council	56,705	55,674	56,525	58,260	...	65,323	66,440	63,896	67,837	...	16½	1,028,899	+121,231
Maidstone Corporation	272	251	263	264	...	350	279	269	271	...	16½	4,695	+ 656
Manchester Corporation	20,234	20,844	20,510	21,307	...	24,236	24,520	25,619	25,937	...	17	427,897	- 81,586
Newcastle-on-Tyne Corporation ...	7,582	7,789	8,012	8,274	...	8,800	8,967	9,284	9,260	...	17	153,391	- 24,655
New St. Helens and District ...	1,806	1,783	1,506	1,674	...	2,101	1,986	1,732	1,760	...	4	6,349	- 483
Northampton Corporation	834	819	852	861	...	842	820	869	847	...	17	14,642	+ 1,106
Nottingham Corporation	4,500	4,485	4,483	4,631	...	6,092	5,924	5,966	6,224	...	17	97,106	+ 25,444
Oldham Corporation	2,992	2,955	3,038	2,888	...	3,341	3,336	3,559	3,649	...	18	62,293	+ 11,323
Reading Corporation	1,064	1,032	1,075	1,108	...	1,379	1,367	1,341	1,339	...	16	21,434	—
Rhondda Tramways	1,617	1,546	1,567	1,603	...	1,629	1,674	1,750	1,801	...	30	49,993	+ 7,147
Rotherham Corporation	1,802	741	1,858	1,764	...	2,345	2,339	2,439	2,520	...	17⅜	38,571	+ 7,914
Sheffield Corporation	12,211	12,161	12,506	12,149	...	13,407	12,805	13,378	13,479	...	17½	240,126	+ 30,352
Southampton Corporation	2,049	2,079	2,101	2,179	...	2,651	2,739	2,544	2,602	...	16⅜	41,621	+ 9,625
Southend-on-Sea Corporation ...	1,057	1,011	1,112	1,214	...	1,334	1,459	1,370	1,493	...	17	17,705	+ 2,010
South Shields	945	964	...	...	...	1,136	1,164	...	...	...	—	—	—
Sunderland Corporation	1,783	1,818	1,939	2,033	...	1,995	2,049	2,168	2,212	...	17	35,613	+ 5,170
Swindon Corporation	272	269	290	291	...	293	310	296	306	...	16⅜	4,887	+ 480
Torquay Tramways	676	1,021	709	815	...	1,049	741	974	1,079	...	30	23,870	+ 7,251
Tyneside Tramways and Tramroads	1,132	907	1,005	...	...	1,384	1,112	1,199	...	...	3	2,755	+ 246
Wallasey Corporation	1,830	1,932	1,839	2,049	...	2,151	2,014	2,000	2,133	...	16⅛	31,482	+ 4,829
Walsall Corporation	979	947	974	984	...	1,181	1,195	1,150	1,237	...	17	20,480	+ 4,554
Walthamstow U.D. Council ...	1,359	1,230	1,286	1,425	...	1,659	1,523	1,389	1,471	...	17	24,956	+ 3,704
Warrington Corporation	562	538	...	...	...	739	716	...	...	...	15	10,737	+ 3,147
West Ham Corporation	3,732	3,676	3,733	3,792	...	4,743	4,727	4,632	4,711	...	16½	71,871	+ 9,781
Wigan Corporation	...	2,034	1,963	2,043	...	...	...	2,202	2,258	...	17	38,166	+ 6,028

*** During the war the issue of traffic returns has been suspended by a number of undertakings.

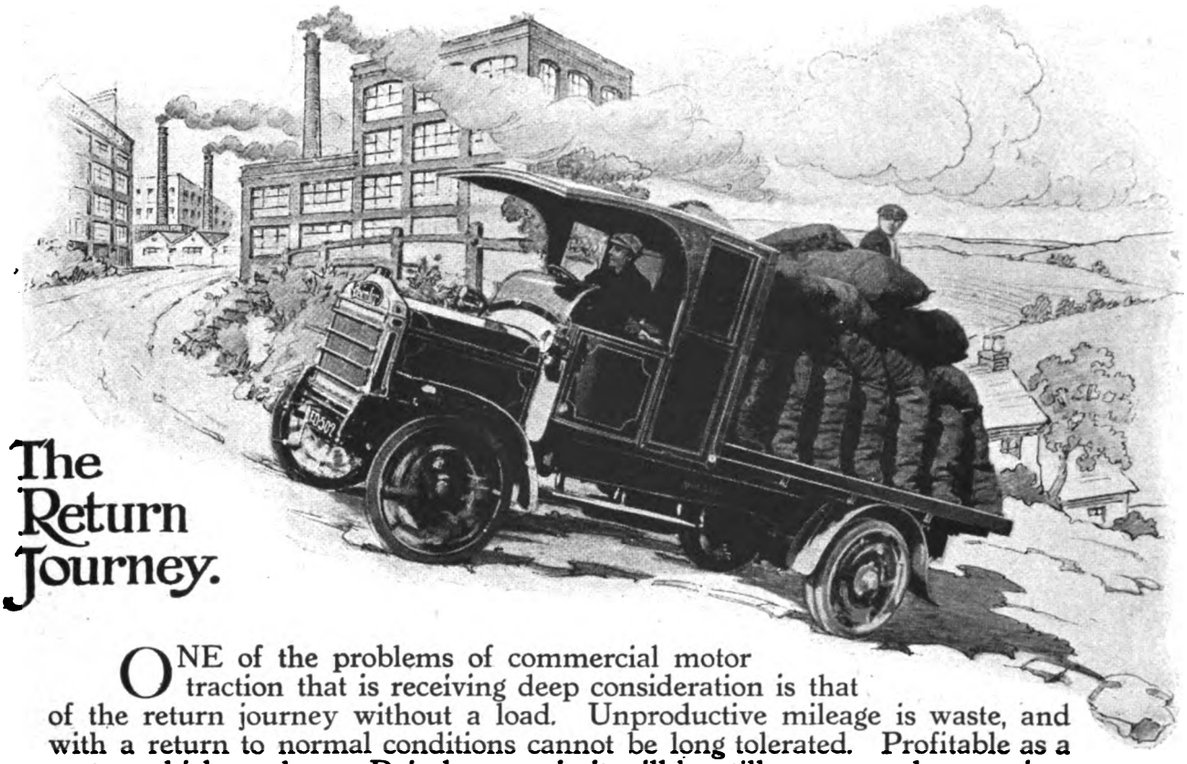
Colonial and Foreign Tramway Traffic Returns.

NAME OF COMPANY.	1917. WEEKS ENDED.					1918. WEEKS ENDED.					AGGREGATE.		
	July 7.	July 14.	July 21.	July 28.		July 6.	July 13.	July 20.	July 27.		Wks.	1918.	Increase or Decrease.
	£	£	£	£	£	£	£	£	£	£		£	£
Anglo-Argentine	50,782	52,007	48,949	46,664	...	55,714	54,657	56,279	56,375	...	30	1,656,330	+120,869
Calcutta ... ... Rs.	66,365	68,988	70,114	71,995	...	79,508	77,438	73,037	77,973	...	40	2,170,118	+168,710
Madras ... ... Rs.	(2 weeks)	36,083	...	...	...	(2 weeks)	42,280	...	...	...	28	525,690	+ 81,191
Pernambuco	...	...	4,003	...	...	...	...	4,452	...	...	29	130,204	+ 23,159

Companies Issuing Monthly Statements only.

	1917.						1918.						Wks.	AGGREGATE.	
	Feb.	March.	April.	May.	June.	July.	Feb.	March.	April.	May.	June.	July.		1918.	+ or —.
	£	£	£	£	£	£	£	£	£	£	£	£		£	£
Ballarat & Bendigo ..	3,196	3,329	4,538	2,877	...	...	3,902	3,928	4,094	3,287	...	...	8	7,381	— 34
Brazilian Traction Mlns	6872000	7549000	7453000	7864000	7642000	...	7315000	8094000	8330000	9030000	9087000	...	26	49,693.000	+5,047.000
Brisbane	29,800	33,340	31,620	33,340	32,475	32,720	32,009	35,530	35,530	37,610	36,245	36,360	30	247,784	+ 21,469
British Columbia ... $	451,679	456,626	447,429	438,919	373,029	...	501,150	510,892	515,417	486,876	488,873	...	52	5,986,437	+ 660,055
Buenos Ayres Lacroze	35,977	41,337	39,111	40,595	38,020	38,063	34,398	42,647	41,643	41,315	38,375	41,145	4	41,145	+ 3,082
Burma	22,912	27,132	23,660	24,906	25,463	...	22,985	27,906	27,614	29,019	31,158	...	48	299,933	+ 14,753
Cape Town	...	17,688	16,705	...	...	...	...	19,911	19,011	...	17,612	...	—	—	—
Carthagena & Herrerias	3,223	2,955	4,366	4,321	5,325	5,763	4,031	5,316	4,200	5,027	5,047	5,491	30	33,123	+ 3,188
Cordoba	11,896	...	13,660	13,735	...	...	12,972	...	14,799	15,649	...	...	8	30,448	+ 3,053
East India	1,570	1,647	1,445	1,455	1,186	1,183	1,318	1,729	1,791	1,920	1,754	1,968	52	17,929	— 3,580
Kalgoorlie	2,193	2,772	...	...	...	...	2,373	2,700	...	...	...	...	13	7,595	+ 199
La Plata	4,092	4,528	4,230	4,127	3,852	3,876	4,745	5,347	5,169	5,105	5,134	6,722	30	36,934	+ 7,914
Lima	34,228	37,586	37,834	35,336	...	...	41,913	42,106	43,557	42,881	...	...	21	213,993	+ 32,168
Manaos ... ... Rs.	144,532	161,156	...	...	...	...	133,591	157,337	...	...	...	...	13	442,799	+ 3,819
Manila ... ... $	...	67,140	65,600	61,500	...	...	...	9,700	84,000	93,500	...	...	21	367,500	+ 100,060
Monte Video	32,304	31,979	29,230	28,716	27,458	28,597	34,573	36,659	33,704	32,301	30,503	31,684	39	300,525	+ 29,132
Peruvian ... ... $	844,770	1017000	957,500	902,780	965,420	975,000	925,410	1119530	1079880	1022120	1099470	987,300	4	987,300	+ 12,300
Port Elizabeth	...	4,428	3,904	...	...	...	...	4,425	4,028	...	5,404	...	—	—	—
Rangoon	4,605	6,226	5,036	4,737	4,383	...	5,662	5,955	5,885	5,719	6,163	...	26	34,745	+ 5,125
Toronto ... ... $	932,567	991,192	970,367	992,460	984,529	...	981,933	1113472	1065766	1090747	1035932	...	26	6,356,169	+ 482,585
Winnipeg ... $	280,717	293,094	265,594	259,794	254,226	...	298,899	307,289	296,433	280,935	293,140	...	26	1,811,338	+ 137,968

Digitized by Google



The Return Journey.

ONE of the problems of commercial motor traction that is receiving deep consideration is that of the return journey without a load. Unproductive mileage is waste, and with a return to normal conditions cannot be long tolerated. Profitable as a motor vehicle, such as a Daimler, now is, it will be still more so when services are properly organised and efforts co-ordinated.

When the war ends there will be money to be made by the owners of *good* Lorries. Trade will flow in the channels where it can be dealt with. Delivery of materials will be the principal object. Price will be a secondary consideration. Get on the Daimler List. It is the sure and certain way to profits.

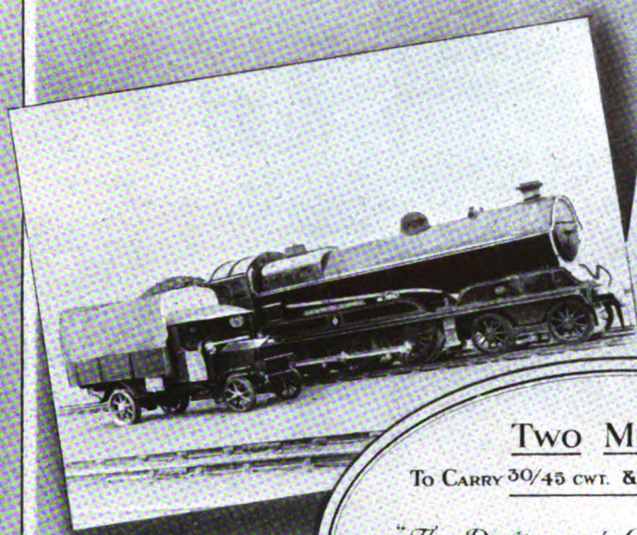
Daimler

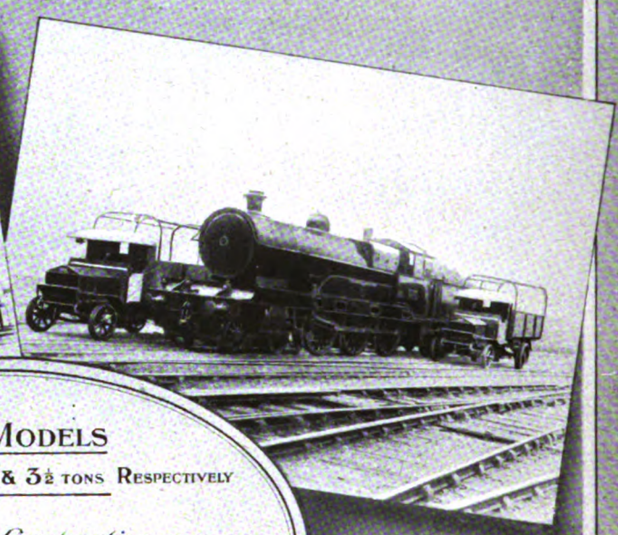
The Daimler Company, Ltd.
Coventry

Digitized by Google

NAPIER

MOTOR VEHICLES.





TWO MODELS

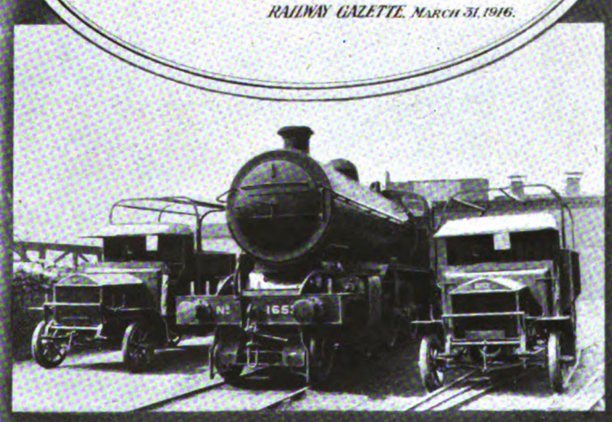
TO CARRY 30/45 CWT. & 3½ TONS RESPECTIVELY

"The Design and Construction are Throughout of a Character, which it would be Exceedingly Difficult, if not Impossible, to Improve Upon."

RAILWAY GAZETTE, MARCH 31, 1916.

IN PEACE

USED BY THE LARGEST CARRYING COMPANIES AND COMMERCIAL HOUSES.



IN WAR

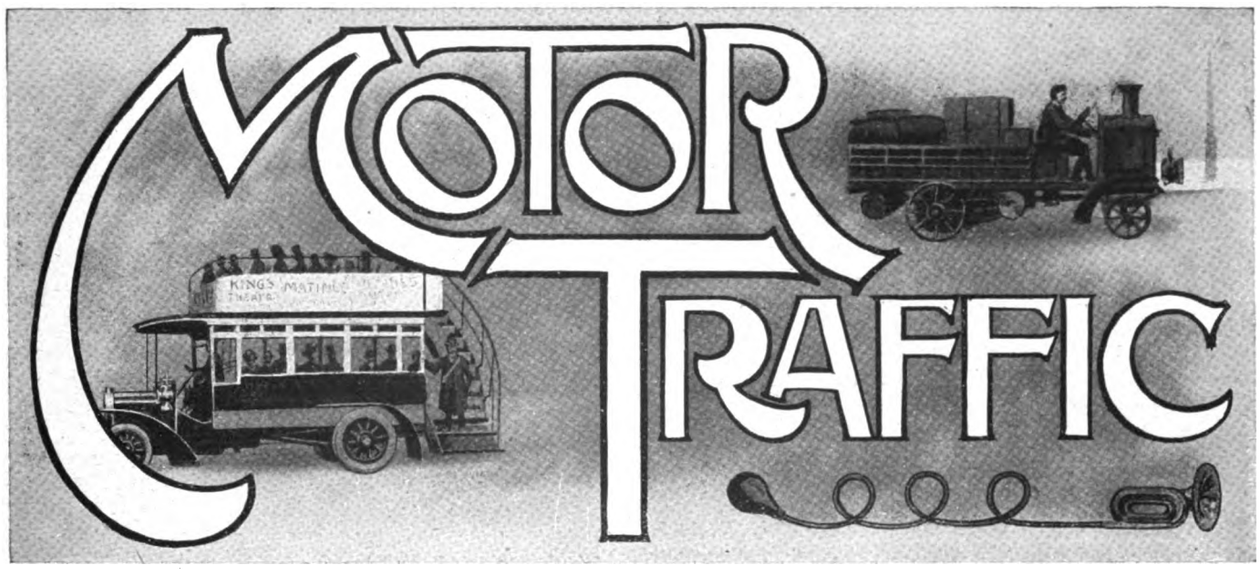
USED BY THE BRITISH AND ALLIED GOVERNMENTS.

D·NAPIER & SON LTD.

WORKS
ACTON, LONDON. W

14, NEW BURLINGTON ST. LONDON. W.

Digitized by Google



GAS-DRIVEN OMNIBUSES.

Much importance attaches to the system of gas traction for omnibuses, which is described and illustrated in this issue. The whole cumbrous and unsightly arrangement of a "flexible container," in plain English, a huge gas bag, on the top of a motor vehicle is done away with; its place is taken by metal cylinders placed out of sight, where the gas is stored at high pressures. The scarcity and high price of petrol has led to the considerable use of gas for commercial motor vehicles, but the gas-bag arrangement, which can be endured in their case, is quite inapplicable to double-deck omnibuses. If the roof seats were abolished, the earning power would be cut down enormously, and the vehicles which in London cannot at present carry all the traffic which offers would be further handicapped. It was plain from the first that if gas was to be used it must be carried in a compressed state in or under the vehicles, just as it has been in the case of a few tramways which have been worked by gas traction. The conditions of service for omnibuses in London are peculiarly severe, and a design had to be got out which would, on the one hand, meet these conditions, and at the same time secure the approval of the Metropolitan Police authorities. The scheme worked out by the engineering staff of the London General Omnibus Company fulfils the second of these requirements, and so far as can be judged before prolonged daily experience on the road has been obtained, it fulfils the first.

* * * * * *

A point to be noticed is that the system is both simple and efficient in its elements, and that the gas supply is so automatically regulated that the driver has no more to do than when petrol fuel is used. In fact, so far as he is concerned he might be driving a petrol omnibus. Further, very severe hill-climbing tests show that the automatic supply to the engine is fully sufficient and constant under the most severe loads. It will be seen from the illustrations, also, that no change whatever is made in the appearance of the omnibus. Particular attention has, of course, been given to the design and construction of the cylinders which are to hold the compressed gas. They have not only to be gas-tight to begin with, but they have to remain so under the continual shock and vibration to which everything on an omnibus is subjected. They have also to be very strong in order to stand the pressure, and in that connection it is of special interest to note that they are wound with steel tape in the same way as a big gun is. It may further be pointed out that the automatic feed to the engine is at low pressure, and that an offset to the weight of the cylinders is found by substituting gas lighting of the omnibuses for electric lighting. That does away with the weight of a small dynamo and a storage battery.

PROTECTION AND THE MOTOR INDUSTRY.

It would appear that we are approaching the time when the Government may be expected to give a bold indication of its policy in the matter of the protection of British industries by means of taxation of imports. We are told that the War Cabinet has approved a scheme of Imperial preference. The adoption of any such scheme obviously involves the widespread imposition of tariffs. The matter has no doubt been pushed ahead not only by the Dominion Governments, but also by the evident need of coming into line with our Allies with respect to some general policy in the mutual interests of the whole group of Powers, and intended, at least partly, to serve as a strong weapon against our present enemies. Unquestionably if we all act together in this matter we can deal German commerce an almost fatal blow. Consequently, our ability so to act represents a great asset in our hands when it comes to the negotiation of peace terms. It is, in fact, an asset which we certainly ought not to relinquish except in return for considerations of the highest possible value to our friends and ourselves. Thus at one end of the scale we have the evident desirability of so moulding our system as to make it possible to exclude or handicap enemy goods to any desired extent. At the other end we have the desire of the Dominions for the establishment of a closer bond in the shape of an Imperial preference. Taking these two facts in conjunction with the indicated change of opinion within this country itself on the general question of import duties, it would seem that the Engineering Trades Committee was fairly well justified when it took the imposition of such duties for granted, and therefore would not discuss their desirability.

* * * * * *

The main point to be emphasised is that whether we are in principle free traders or protectionists, need not affect our attitude towards proposals which are not put forward except as extraordinary measures to meet extraordinary conditions. Ever since the war broke out we have had to accept the sudden adoption

Digitized by Google

MOTOR TRAFFIC.

of principles against which at any other time we would probably have fought tooth and nail. It will be just as necessary for some of us to recognise that principles which are dear to us must be relinquished, at least for a time, in view of the necessity for re-establishing industries which during the war have been bereft of their hard-earned goodwill through no fault of their own. The motor industry is one of these. Not only will it start its post-war operations under a severe handicap because of its lengthy exclusion from its markets, but it demands particular consideration also upon the ground that it has proved to be absolutely essential to our national well-being, and, in fact, to our national existence. Had we not possessed a motor industry when the war broke out, our difficulties in respect of transport would have been immense, and probably insuperable. We should never have gained our existing superiority in the air, and our output of munitions of war would have been very considerably curtailed. The industry has done wonderful work for the British Empire, and it deserves that this fact should be recognised even if its recognition involves certain steps that some motor users would at any other time be unwilling to take.

NATIONAL ROADS.

On various occasions the view has been expressed in these columns that the roads must be made for the traffic which they are to bear, and that the policy of endeavouring to make the traffic suitable for existing roads is altogether wrong. At the present moment we are faced with a national necessity for considerable expenditure upon road improvement. This is due partly to the serious deterioration of the roads due to war traffic and inefficient maintenance owing to a shortage of labour. It is also in part due to the fact that our roads are now required principally for the purpose of carrying a class of traffic for which they were not originally designed. There are those who, recognising only this latter fact, maintain that if any improvement is to be effected then the new class of traffic must foot the bill. This is really a most obstructive, and, indeed, reactionary point of view. It is as much as to say that an improved method can only obtain the right to be adopted upon payment of taxation or fees representing in principle something very much like an obligation to buy out the obsolete method which is to be displaced. If the owners of motor vehicles were the only people who would benefit by improved roads, then it would be reasonable that they should pay the whole of the cost of improvement. If the whole community will benefit, as will certainly be the case, then the charge should be upon the community. The effect of a general introduction of motors in place of horsed vehicles would be, amongst other things, an immense reduction in the congestion of traffic upon town roads. In towns where traffic is at all heavy the roads must in any case be properly constructed. The consequence is that, in such places, the motor represents a great economy to the whole community. On the other hand, in sparsely populated country districts motors may lead to a certain amount of road wear without producing any corresponding return to local residents. At any rate, their local value and utility does not suffice to justify the local authority in incurring heavy outlay on road reconstruction. The trouble really seems to be that we have reached a point which does not admit of any fair treatment of the subject, short of the nationalisation of the roads. Possibly a compromise will have to be adopted for the time being, but this would be regrettable. It is impossible to deal with the subject properly in small sections and from a parochial standpoint. The great outstanding fact is that enormous sums of money must presently be spent on road reconstruction, and that the cost should be borne by those who will benefit. This would involve expenditure in some districts which would have to be borne by outside sources. The districts which actually benefit by the presence of motors ought to assist those who are temporarily embarrassed by the traffic revolution.

REASONABLE STANDARDISATION.

We cannot expect to be told very much of the plans of motor manufacturers until those plans are complete, but we have the right to assume that the long period that has elapsed since commercial motor vehicles were freely available to the public will not be allowed to terminate without very definite steps having been taken in the direction of securing a degree of standardisation which will facilitate the maintenance of vehicles and also reduce their manufacturing cost. This is possible without standardisation being carried to such extremes as to suppress the individuality of types. No sensible man wants this to happen yet. Healthy competition is good for all, and the excessive standardisation of all vehicles of a certain load capacity would mean the elimination of competition, and almost certainly would involve the formation of a price-maintaining ring. There are, however, great possibilities in standardisation without going so far as this. America has shown us what important results may be obtained by standardising what may appear to be trifles. There is no doubt that at present the industry uses materials, components, and fittings of an unnecessary number of sections, sizes, and types. A moderate degree of standardisation would reduce the number in each case so that there still remained a sufficient variety from which to select, but so that the manufacturers of these materials and other items would be able to concentrate their production upon much fewer lines, and consequently to produce far more cheaply in the lines standardised. The impetus in this direction must come from the vehicle manufacturer, if it is to come at all. Thus, if the vehicle manufacturer make no move, then undoubtedly the user will have a legitimate grievance against the British industry, which may well result in an unnecessarily large proportion of business going to foreign concerns.

£1,000 PRIZE FOR COAL-GAS MOTOR INVENTION.

The offer by the Automobile Association of £1,000 for the best method of using coal gas on motor vehicles appears to have aroused considerable attention. A number of inventions have, it is stated, been definitely entered for the competition and many valuable suggestions have been received. Entries for the competition have been received from well-known engineers and gas experts, private motorists, members of the motoring industry, and working men and mechanics, many of whom have for some time past been endeavouring to devise practical and inexpensive methods of propelling motor vehicles with coal gas and other fuels. Copies of the entry forms and the conditions governing the competition will be sent upon application to the Secretary, A.A. and M.U., Fanum House, Whitcomb Street, London, W.C.2.

Digitized by Google

MOTOR TRAFFIC.

THE NEW CLARKSON MOTOR.

A COKE BURNING STEAM CAR.

The prospect of one penny per mile fuel cost for a standard 5-ton vehicle will ensure the most careful consideration of the new Clarkson coke fuel steam motor, which is shortly to be put upon the market by the National Steam Car Company, Chelmsford and London. The promise which the invention holds out is extremely important at a time when the cost of liquid fuel has appreciated to the extent of between 300 to 400 per cent., and is difficult to obtain in adequate quantities even for work of considerable importance to the community.

We have known for some time that, encouraged by the success of his experiments in the conversion of a number of the company's oil burning machines to coke fuel burners, Mr. T. Clarkson was patiently working to evolve a new type of steam motor specially designed for coke fuel, in which as far as possible all the defects of past practice should be eliminated. Naturally the difficulties, both with regard to labour and material, have proved a severe handicap, but it is safe to say that a study of the illustrated description that we are now able to give of the new motor will convince readers that Mr. Clarkson's latest design is worthy of his high reputation, and that he is to be congratulated upon his achievement.

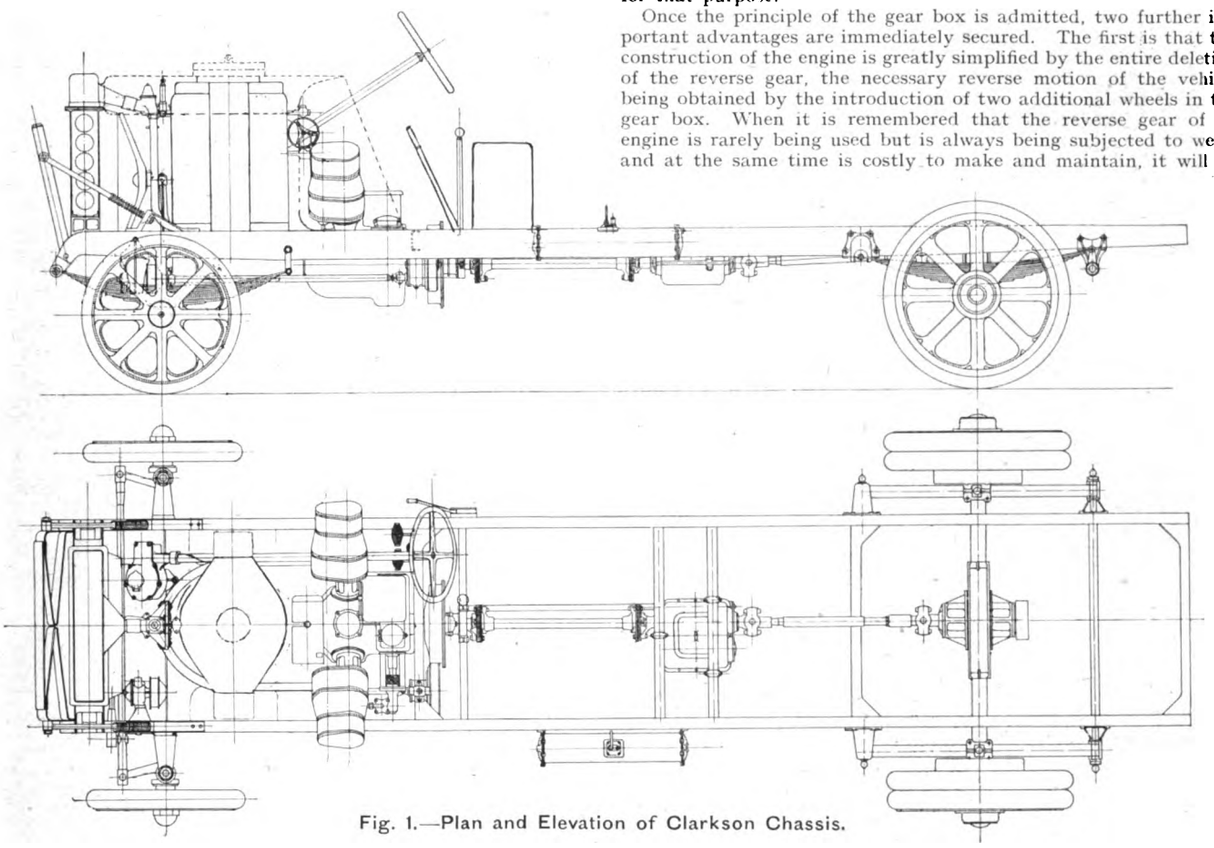


Fig. 1.—Plan and Elevation of Clarkson Chassis.

On the invitation of Mr. Clarkson, a representative of THE TRAMWAY AND RAILWAY WORLD recently had the opportunity to inspect the new machine, and to test its capabilities in running. As a result a firm opinion was formed that for smoothness in running, ease of control, and rapidity of acceleration even from a dead start on a stiff gradient the motor leaves little to be desired.

The power unit is primarily intended for use on industrial road vehicles. It is simple in construction, strong, and eminently suitable for operation by relatively unskilled drivers. A most important feature in the design of this new steam chassis is the standardisation of the controls in such a manner that the driver need have nothing to do with the adjustment of the mechanism or its lubrication. All that is necessary for him to do is to control the vehicle in precisely the same manner as with a petrol motor. It therefore follows that a driver used to handling a petrol machine can at once operate the new vehicle, and will find each pedal and lever in the usual position. Moreover, each performs the same function as that to which he has been accustomed, i.e., in addition to the steering column there is a clutch pedal operated by the left foot, brake pedal by the right foot, and the usual levers for the hand brake and gear change (Fig. 4).

In arriving at the decision to instal a gear box, Mr. Clarkson explains that experience has proved conclusively that an engine, whether steam or petrol, cannot develop its full power unless it has sufficient piston speed. Therefore it follows that in order to meet the extreme conditions of heavy loads and soft ground, and light loads and hard ground, at least two gear ratios are necessary between the engine and the driving wheels. Hitherto it has been held that a steam engine having a wider range of flexibility than a petrol engine could be fitted to a commercial vehicle without a gear box, and many vehicles have been so constructed. It is clear, however, that in order to meet the heavy load and soft ground conditions a larger engine is necessary than would serve for the ordinary working conditions. The inventor was consequently led to the conclusion that an emergency gear ratio should be provided for that purpose.

Once the principle of the gear box is admitted, two further important advantages are immediately secured. The first is that the construction of the engine is greatly simplified by the entire deletion of the reverse gear, the necessary reverse motion of the vehicle being obtained by the introduction of two additional wheels in the gear box. When it is remembered that the reverse gear of an engine is rarely being used but is always being subjected to wear, and at the same time is costly to make and maintain, it will be appreciated that the employment of the one-direction engine, such as is installed in the Clarkson power unit, is a decided advance in simplicity and efficiency. The other important advantage resulting from the adoption of the gear box and clutch is that the engine can be run "free." This is useful not only for warming up first thing in the morning, but also because during long waits the engine can be allowed to turn over quietly. In this condition the vehicle can be left for an indefinite time, as the engine will automatically look after the maintenance of water feed, steam pressure, and lubrication. In an actual test the chassis was left with steam up all night without any attention from the driver; in this condition it was instantly available for service in the morning. Moreover, the consumption of coke in turning the engine round in this way was comparatively insignificant.

As will be seen from the plan and elevation of the chassis, Fig. 1, the Clarkson new power unit—to be known as type ix.—comprises boiler, engine, and condenser. This is arranged in so compact a form that with very slight alteration to the frame it could be mounted upon any 3-ton chassis of standard make. The boiler consists of two cylindrical steel shells, flanged and bolted together at each end. The shells are each forged and drawn under hydraulic pressure, there

Digitized by Google

MOTOR TRAFFIC.

being no welds or rivets in any part of the boiler. Fig. 2 shows the inner and outer shells, and also a view looking in from the top of the boiler, from which the water tubes or thimbles can be seen. The outer shell is formed with thickening belts where holes have to be drilled for the attachment of boiler fittings. The inner shell is drilled for the reception of the water tubes, which are of the "thimble" type, 4 inches long, tapering to the inside end but of an average diameter of 1¼ inches.

These tubes are not expanded, but are pressed into the inner shell and held in position by the pressure within the boiler. It will be noted that in this simple arrangement one of the most prolific sources of trouble in the ordinary steam boiler, viz., leaky tubes, is effectively avoided. The working pressure is from 300 to 350 lbs. per square inch, and the maintenance of this pressure is automatically controlled by an oscillating valve, which regulates the draught of the fire according to the requirements.

View Showing Water Thimbles.
On the Left—Outer Shell.
On the Right—Inner Shell.

Fig. 2.—The Boiler.

Although the boiler is designed for solid fuel, liquid fuel can be used if desired. The solid fuel is fed through the central tube at the top of the boiler, this tube being surrounded by a super-heating coil, the temperature of the super-heat being 620 deg. Fahr. The supply of water to the boiler is delivered by a pump operated by the engine at reduced speed. This is controlled automatically by

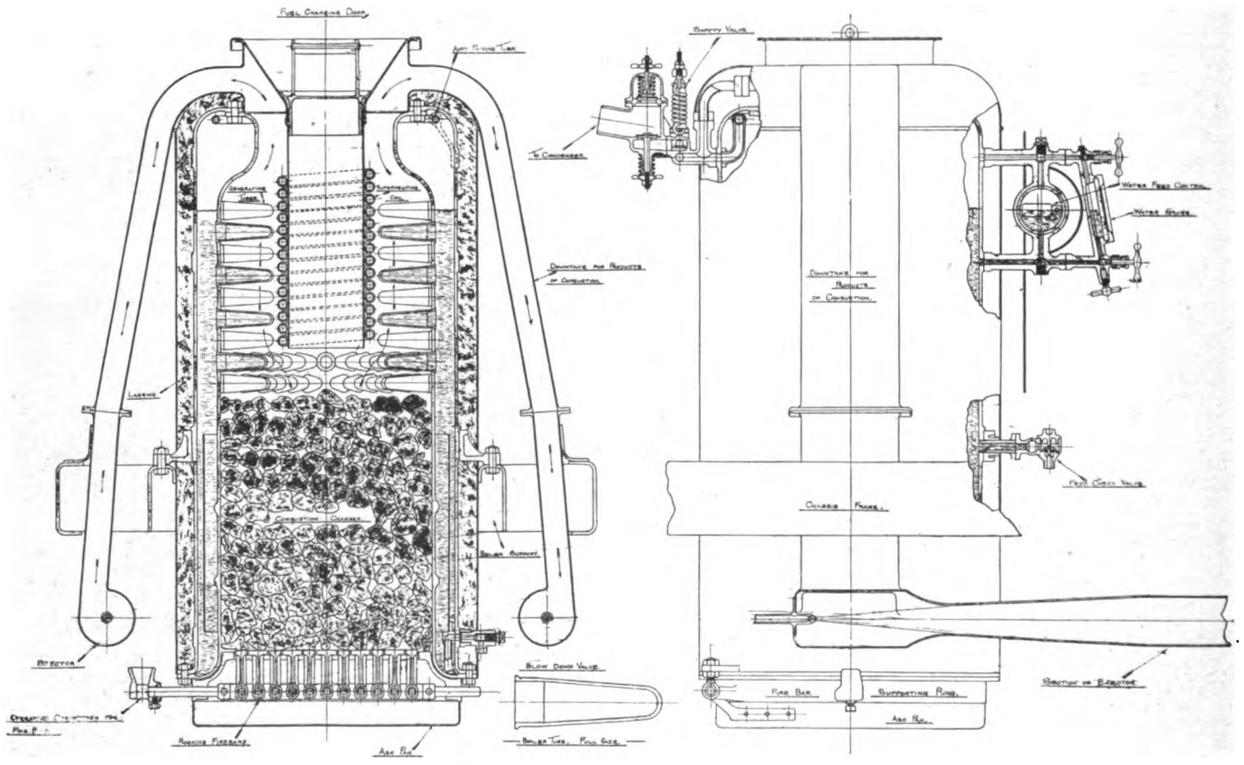


Fig. 3.—Arrangement of Boiler.

Digitized by Google

MOTOR TRAFFIC.

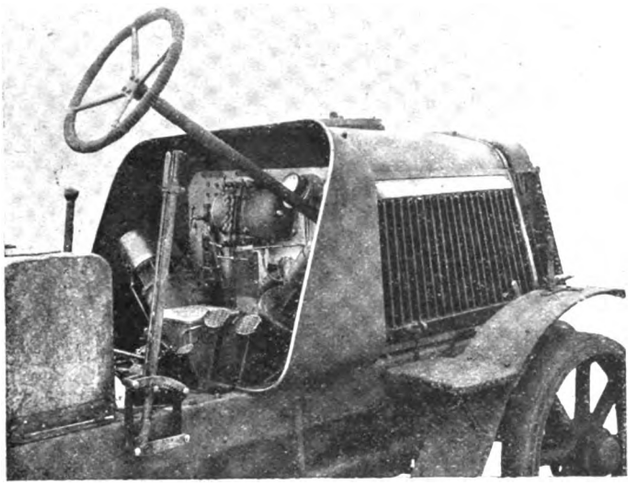


Fig. 4.—View of Forward End Showing Control Levers and Pedals.

Fig. 7.—Front View Showing Condenser.

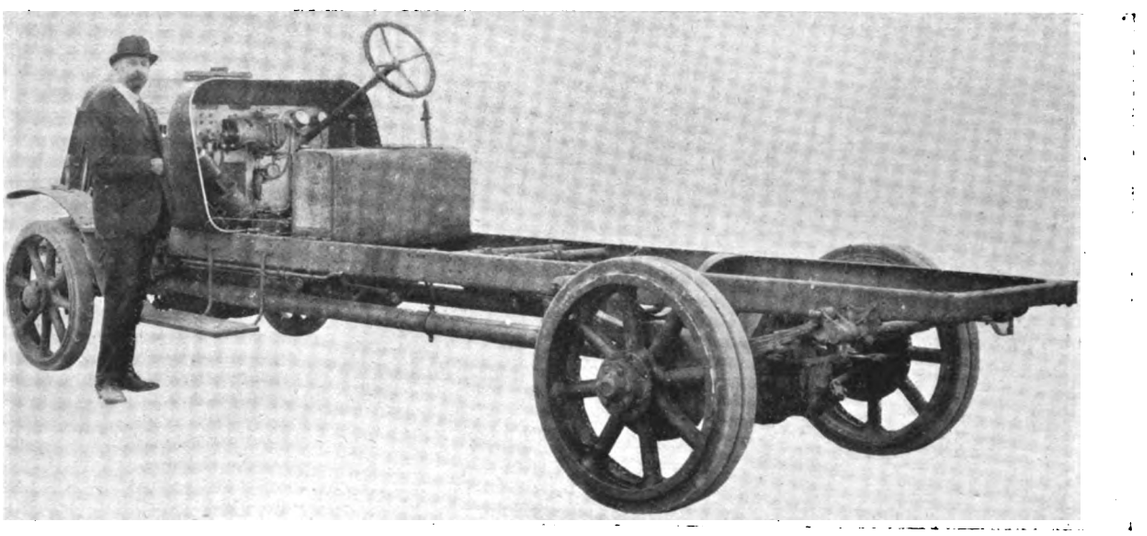


Fig. 5.—General View of Chassis from the Rear.

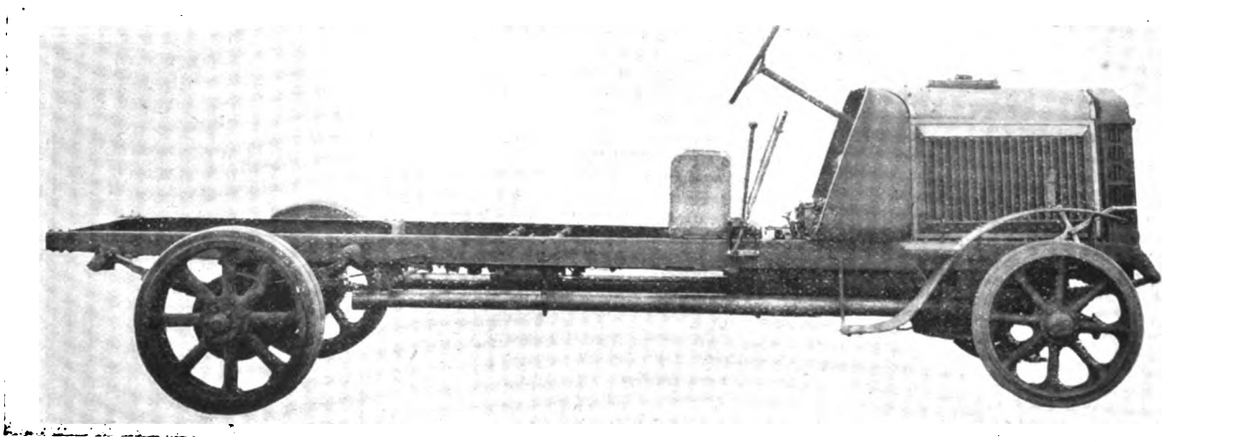


Fig. 6.—View Showing Side Elevation of Chassis.

Digitized by Google

MOTOR TRAFFIC.

a reciprocating float, which acts upon the foot valve of the feed pump in such a manner that, as the float rises with the water level, it prevents the foot valve returning to its seating (Figs. 8 and 10). As a result the charge of water drawn into the pump barrel returns to the tank instead of being forced into the boiler, until such time as the float descends and allows the foot valve again to become operative. As will be seen, this system of water control maintains a constant working level in the boiler without any attention from the driver.

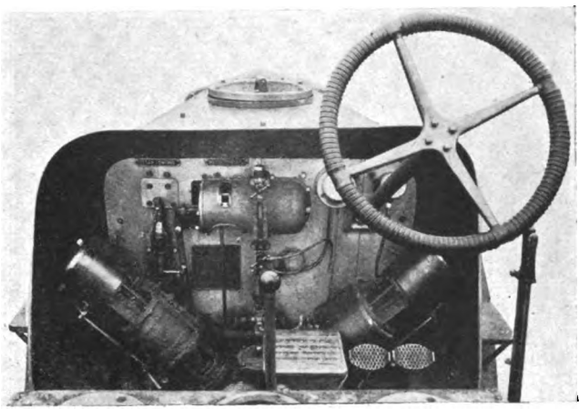


Fig. 8.—View Inside Dash, Showing Position of Engine, Reciprocating Float, etc.

The feed water is introduced at the waist of the boiler, but is not permitted to impinge directly upon the inner shell of the boiler, which is in direct contact with incandescent fuel. The water first strikes a thin steel plate between the inner and outer shell, and any deposit from mineral salts that may be contained in the water is thus arrested, and, falling by gravity to the lowest part of the boiler, is from there removed by the blow-off valve. A safety valve of the usual locomotive type is provided, which discharges through a vacuum valve into the condenser. The boiler is also fitted with blow-down valve, feed check, and reflex water gauge. The complete arrangement of the boiler is shown in Fig. 3.

The engine is a vee type tandem compound, and a good idea of the general arrangement of its detail will be gathered from the drawing which is reproduced in Fig. 9. The engine's location in the chassis can be clearly seen in the illustration showing the inside of the dash in Fig. 8. The two pairs of high and low pressure cylinders operate the same crank at an angle of 90°. Thus a very even torque is obtained as well as a perfect balance, securing smoothness of running and absence of vibration at speeds up to 1,500 revolutions per minute. The leading dimensions of the engine are as follows :—

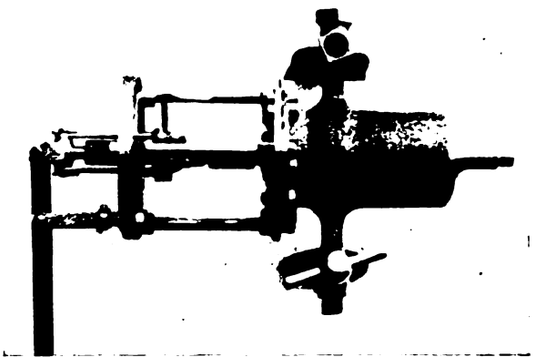


Fig. 10.—Float Operating Gear.

High pressure cylinders, 3 in. diameter ; low pressure, 5 in.; with 3 in. stroke in each case.

The engine is enclosed and self-lubricating, two systems of lubrication being employed. For the cylinder lubrication a trigger pump is provided. This is immersed in a bath of cylinder oil, and is so set that a drop of oil is forced into the steam pipe once in every 100 revolutions. A film of oil is thus maintained upon the inner surfaces without the possibility of excess. For the general lubrication of the engine, a gear pump is provided. This is placed in the lowest part of the crank case, and is therefore not subject to air locks. The oil is conveyed under pressure from this pump to all the

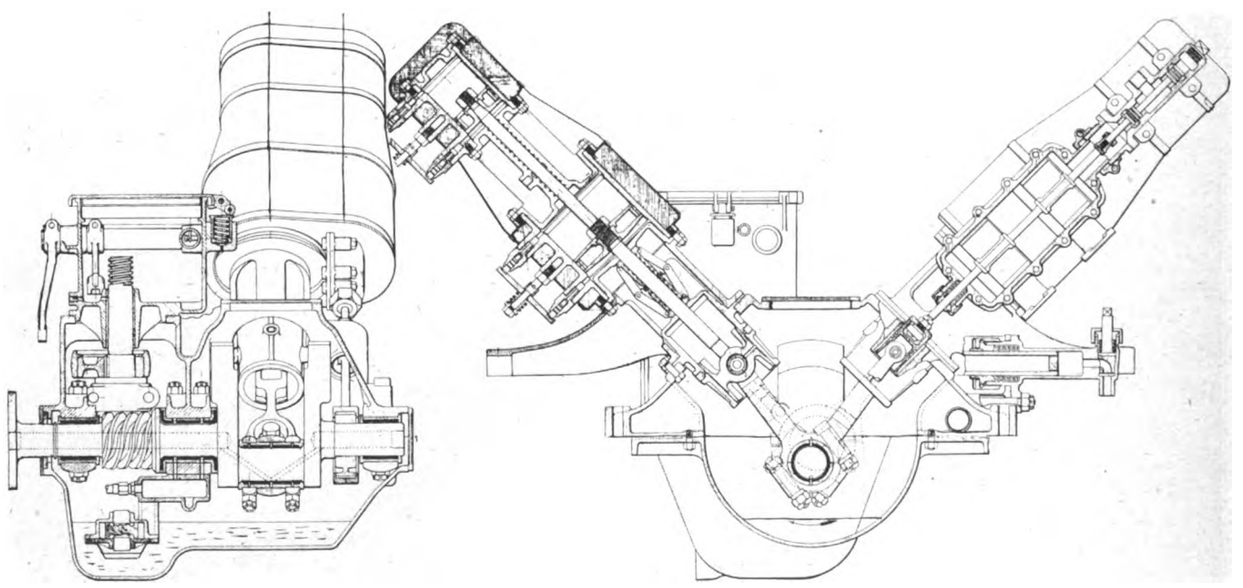


Fig. 9.—Arrangement of the Clarkson Engine.

As the vehicle can travel from 30 to 60 miles on one charge of water—the actual mileage being dependent upon the character of the load and road—it can easily be arranged for supplies of clean water to be taken more or less at regular intervals, and so obviate the questionable practice of picking up supplies from ponds and other doubtful sources.

working parts of the engine, including the three journals on the crank-shaft, the crank-pin, eccentric, and crosshead guides. The latter feature is a new development in engine lubrication.

The crossheads are made of steel, case-hardened and ground with about three one-thousandths of an inch clearance in a ground cylindrical crosshead guide. At the point of mid-stroke oil is

Digitized by Google

MOTOR TRAFFIC.

introduced through the crosshead guide on to the working face of the crosshead, and as the length of the crosshead is in excess of the length of the stroke, it follows that the hole supplying the lubricant is never uncovered by the crosshead. By suitable channelling in the face of the crosshead, and holes leading therefrom to the gudgeon

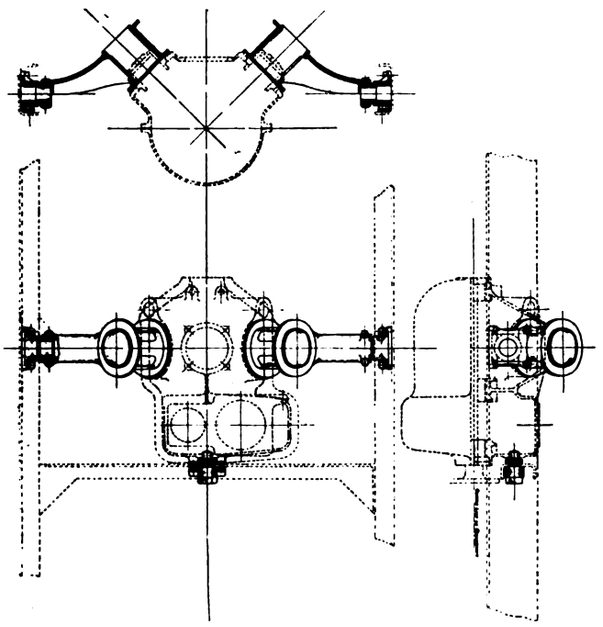


Fig. 11.—Plan Showing Method of Mounting Engine.

pin, this also is placed in communication with the oil pressure feed. This unique arrangement has been found in practice to work with complete satisfaction.

Piston valves are used on the high pressure cylinders, and flat valves on the low pressure, a single eccentric operating all the valves on both lines of cylinders.

The method of mounting the engine on the chassis frame is a novel departure, and provides for the utmost flexibility and stability. This is clearly shown in the drawing, Fig. 11. As will be seen, the

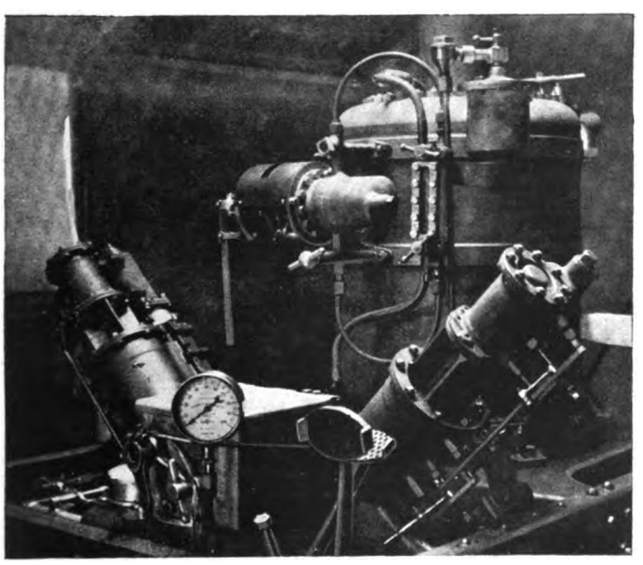


Fig. 12.—View Showing Complete Power Unit on Test Bed.

engine is connected to the frame by two extending arms, which terminate in bearings, the bearings embracing trunnions which are securely bolted to the side members of the frame. At the rear of the engine a cross member of the frame carries a pin, which fits into a hole on the pump case of the engine. The engine is thus carried upon three cylindrical supports, and is free to slide upon them, there being no unnecessary constraint imposed upon the engine, and at the same time it has a wide base of support to resist the torque and to carry the weight without the employment of a sub-frame.

The condenser is situated in the position usually occupied by the radiator on a petrol chassis, and as the illustration (Fig. 7) shows, varies very little in appearance from that familiar component. It consists of a top and bottom header connected by tubes. Considerable trouble has been experienced in the past in keeping condensers of this type watertight under conditions of road vibration and the strains introduced by the expansion of the radiating tubes, due to the passage of steam through them. The improved method adopted in the present case has entirely remedied this defect. This improvement consists in allowing the lower tube plate to move up and down within suitable guides, as may be necessitated by the changes of temperature in the tubes. In other words, the lower header is actually hung upon the tubes, and is kept in position within the guides by four short stiff springs.

The back of the condenser is shrouded, and fitted with a powerful fan driven by a belt from a short lay-shaft running along the side of the chassis from the engine. At the forward end of the lay-shaft a rotary pump is placed for the purpose of draining the lower header of the condenser, returning the water of condensation to the tank through a filter in which the cylinder oil is extracted.

From the foregoing description of the general views shown in Figs. 4, 5, and 6 it will be seen that the new Clarkson chassis is identical with a standard 3-ton petrol machine with the exception of the power unit. Thus, when considering the all-important question of fuel cost, it is possible to obtain figures which are of real comparative value. On the road it has been found that the Clarkson 3-ton lorry will run a mile with a consumption of 5 lb. of coke; this with a full load. When running light the consumption does not exceed 3½ lb. per mile. As the present price of coke is 35s. per ton, the cost of 5 lb. of coke can be taken approximately at one penny. Moreover, on account of the increasing scarcity of all liquid fuels, the Coal Controller is desirous of encouraging the use of coke in every possible way, as there appears to be no likelihood of a shortage of that fuel.

Although primarily designed for commercial road vehicles, the field of usefulness of the Clarkson power unit is much wider. It appears to be well suited under certain conditions for light railways, branch line railways, etc., and interesting experiments in these directions may be anticipated. With the present labour difficulties there is so great a need for transport facilities that do not make further calls upon the inadequate liquid and coal fuel supply, that the utmost encouragement should be given to the rapid development of this coke-burning machine.

GRANTS FOR LONDON OMNIBUS SERVICES.

STATEMENTS IN THE HOUSE OF COMMONS.

In the House of Commons on July 24 Mr. GILBERT asked the Minister of Munitions what were the grounds on which the London General Omnibus Company applied for a subsidy for their motor omnibuses in South-East London; whether the subsidy is paid yearly, half-yearly, or quarterly; whether it is paid on the total mileage run by the omnibuses per week, including Sundays, or if it is only paid on the estimated mileage run when carrying munition workers; can he state if the omnibuses have to give preference to the munition workers on all routes over all other passengers; and can he give any estimate of the total number of munition workers carried on the various omnibus routes since the subsidy has been paid?

Mr. KELLAWAY: The original agreement with the London General Omnibus Company provided that the services in the Woolwich area should be supplied without charge to the Ministry, and it was only when the company stated that they were unable to continue these services without the aid of a subsidy that terms were arranged. The company renders quarterly statements of account. As stated by the present Minister of Blockade in his reply to my hon. friend on June 18, the amount of the present grant is based on the difference between the average earnings per mile of the omnibuses in the South-Eastern area, as compared with the average earnings of the omnibuses in the remainder of the metropolis, subject to certain conditions. The question of giving preference to munition workers was considered, and was found to be impracticable. The number of Arsenal and dockyard workers using the omnibuses is approximately 13,500 a day.

Mr. WATT: Are we to understand that no fares are charged on these omnibuses to munition workers.

Mr. KELLAWAY: Certainly not. Fares are charged. It is not a charity.

Digitized by Google

MOTOR TRAFFIC.

COMPRESSED GAS TRACTION FOR OMNIBUSES.

A NOVEL SYSTEM DESIGNED BY THE LONDON GENERAL OMNIBUS COMPANY.

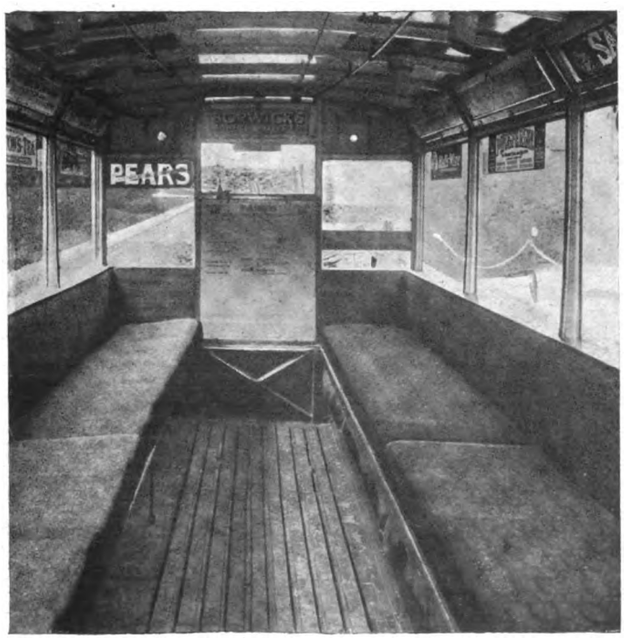
The London General Omnibus Company are among the largest civilian consumers of petrol in the country, for they carry hundreds of millions of passengers per annum by the aid of that fuel. The war scarcity of petrol, not to mention its high price, has, of course, given them great difficulty. For a long time they have been experimenting with various alternative fuels, and they have invited suggestions and ideas from inventors both as to fuel and as to the best method of utilising it. As a result of their investigation the engineering staff of the company have come to the conclusion that the only real alternative fuel available is coal gas. Both from a commercial and traffic point of view it was not possible to carry large gas bags on the roofs of the omnibuses, as this would do away with the outside seats for passengers. Moreover, apart from the question of the outside passenger seats, a fabric container for gas at or about atmospheric pressure would on the roof of an omnibus give a total height which would be impracticable. An accompanying drawing gives the appearance of an omnibus if fitted with a bag to contain sufficient gas for a run of about 25 miles.

Under such conditions the only alternative was to employ compressed gas carried in metal cylinders. This plan having been decided upon, the company's engineers set to work to evolve an equipment which would be practicable, convenient, and safe. On the latter point they had, of course, to satisfy the stringent requirements of the metropolitan police authorities. So far, at least, as this country was concerned, there were not many precedents to help. Years ago, as some readers may remember, a compressed gas system was used on the Blackpool and Lytham Tramways, and down to the present day compressed gas is still employed on the Neath Tramways. In the former case the use of gas was abandoned long before the petrol engine was invented, and the gas engine then employed produced serious vibration. In both instances the undertakings were small, while the individual vehicle was much larger than an omnibus, thus giving more space for the apparatus. The question of space, and also London conditions calling for considerable endurance on each charge of gas, pointed moreover to the employment of a much higher degree of gas compression than had previously been used for such purposes. The experimental, designing, and testing work having now been completed, 20 of the company's omnibuses are being equipped for gas traction. Should the results prove as successful as there is every reason to expect, many more of the company's vehicles will be converted. The following description and illustrations indicate clearly the ingenious character of the equipment, which, it may be added, is being patented by the company.

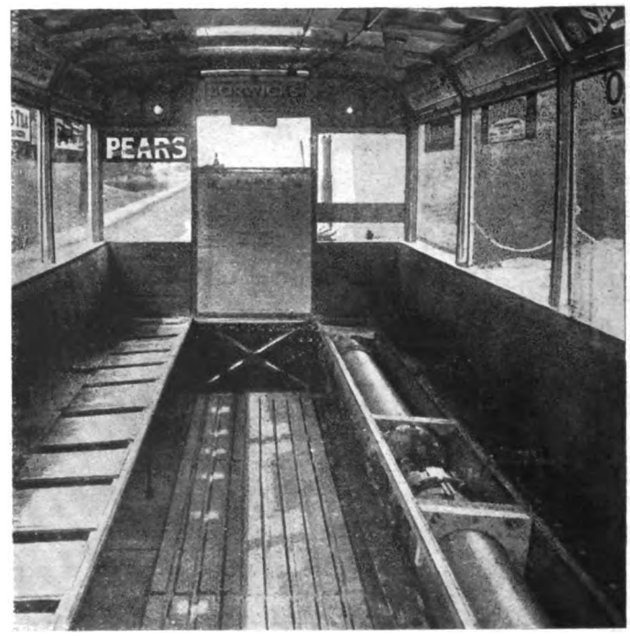
As will be seen from the accompanying drawings, the compressed gas cylinders, which are charged to a maximum pressure of 1,100 lb.

London General Omnibus Running on Compressed Gas.

per sq. inch from a Reavell compressor, are placed under the longitudinal seats of the lower deck, and are completely cased in. At first four cylinders were used, but the design adopted provides for only two—one under each seat, and of greater size. A pipe underneath the body connects the two cylinders. The latter are connected in parallel to a main reducing valve by a pipe of three-eighths in. internal

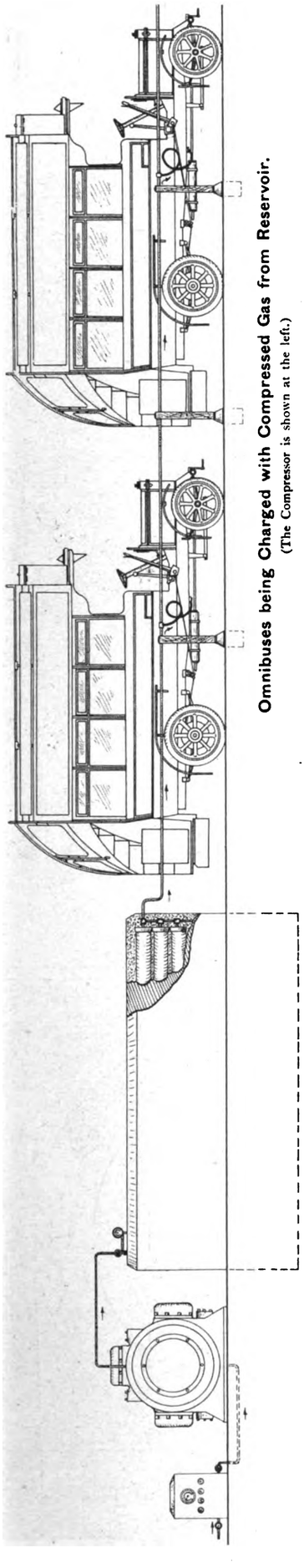


The Interior of the Omnibus.

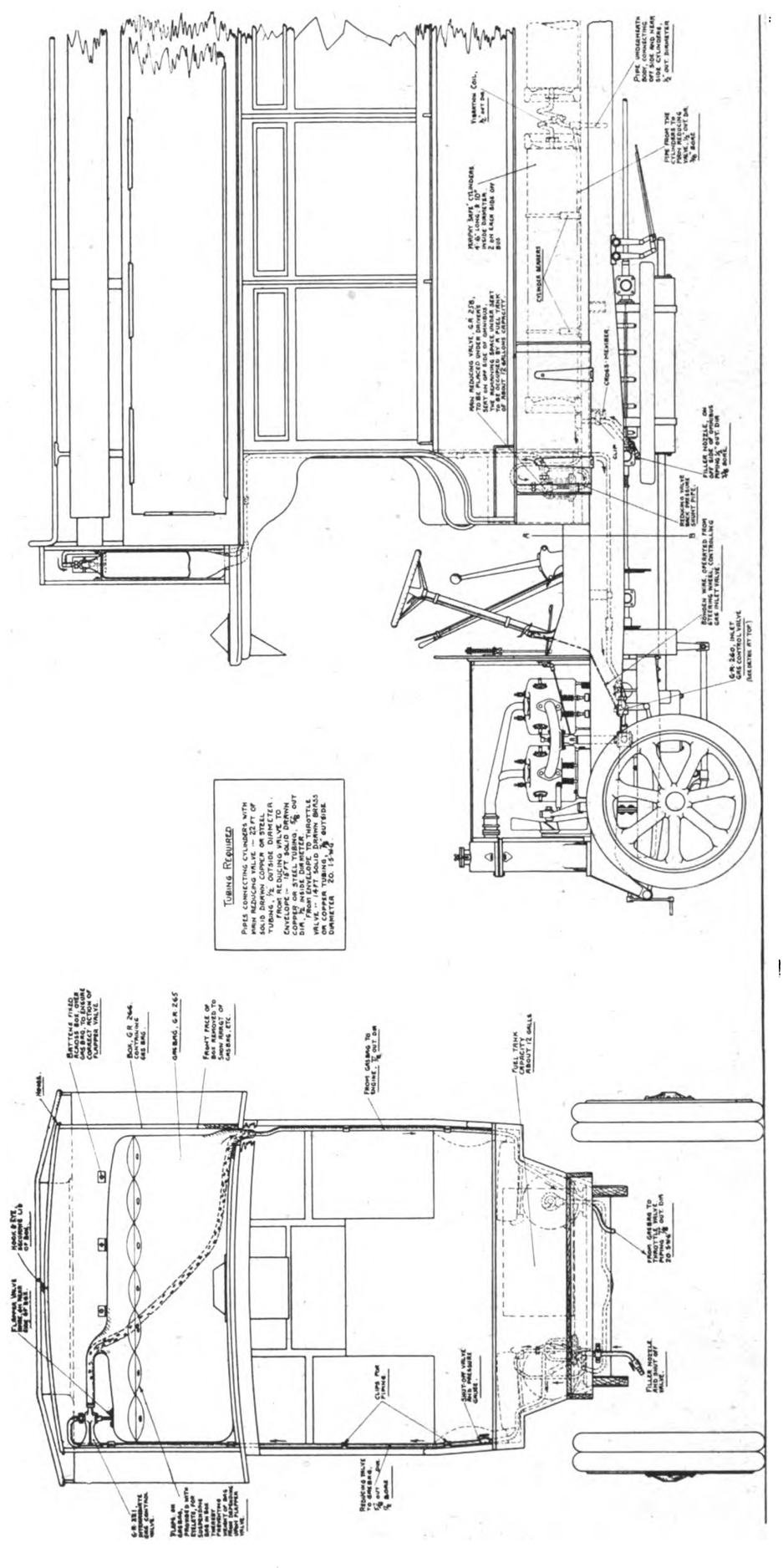


Seat Removed, Showing Cylinders for Compressed Gas.

Digitized by Google



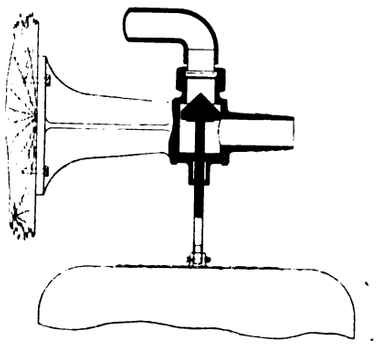
Omnibuses being Charged with Compressed Gas from Reservoir.
(The Compressor is shown at the left.)


TUBING REQUIRED
PIPES CONNECTING CYLINDERS WITH MAIN REDUCING VALVE — 22 FT. OF STEEL TUBING, ½" OUTSIDE DIAMETER.
FROM REDUCING VALVE TO CARBURETTER — 4 FT. OF STEEL TUBING, ¼" OUTSIDE DIAMETER.
FROM REDUCING VALVE TO CARBURETTER — 4 FT. OF STEEL TUBING, ¼" OUT DIA., ⅜" INSIDE DIAMETER
FROM CARBURETTER TO THROTTLE VALVE — 14FT SOLID DRAWN BRASS OR COPPER TUBING, ⅜" OUTSIDE DIAMETER (OR 1/8")

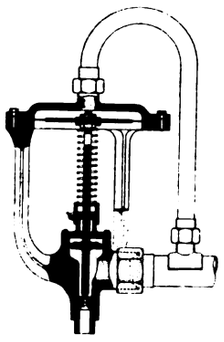
Elevation of London General Omnibuses Equipped for Running on Compressed Gas.

Digitized by Google

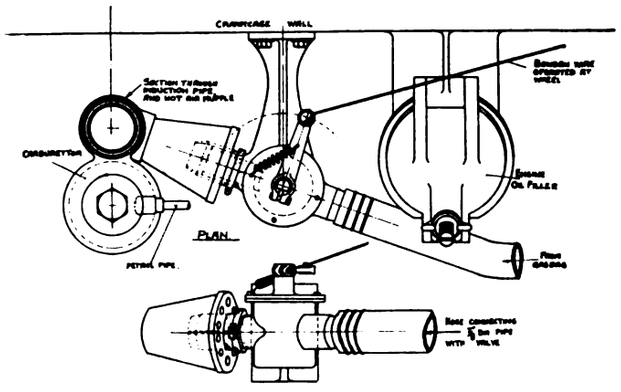
MOTOR TRAFFIC.



Intermediate Gas Control Valve.

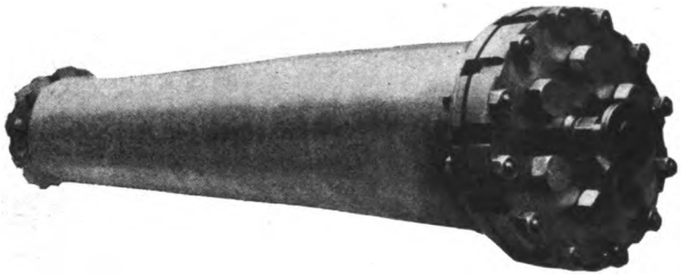


Main Reducing Valve
(Placed under Driver's Seat).



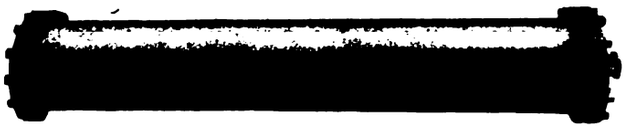
Elevation.

Elevation and Plan of Air Intake and Control Valve.

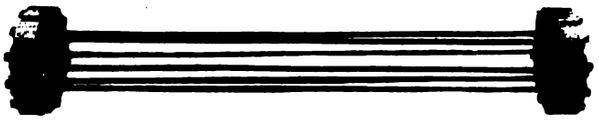


Showing Filler End-Plate of Cylinder.

Cylinder Jacket.

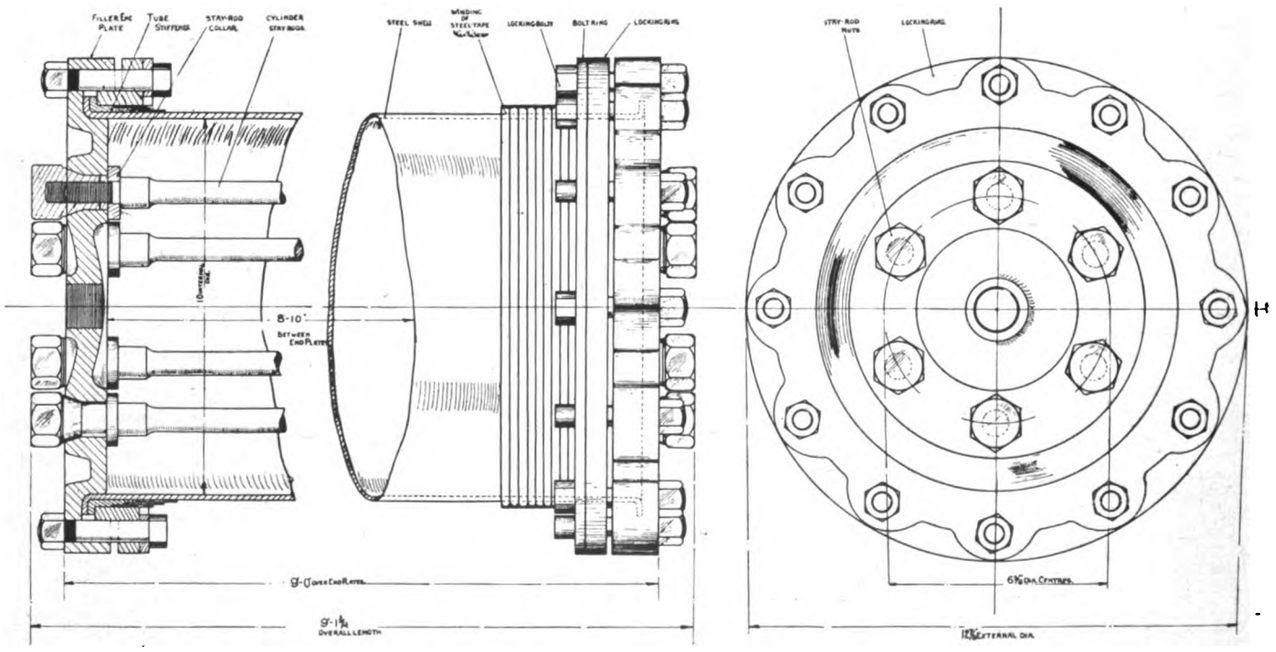


Cylinder Complete.



The Stay Rods.

The High Pressure Cylinder.

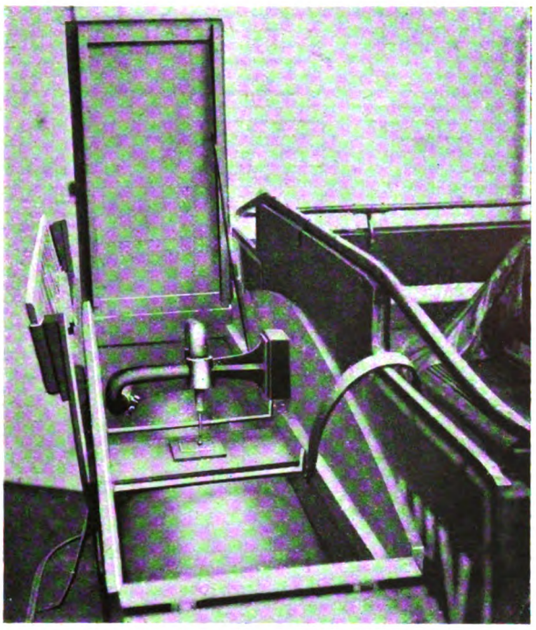


Showing Details of Construction of Cylinder for High Pressure Gas.

Digitized by Google

MOTOR TRAFFIC.

bore. The main reducing valve is a combination of a cut-out and diaphragm valve. The high pressure gas, after being reduced to approximately 2 lb. per sq. inch, passes through a secondary control valve into a flexible container which performs the double function of an expansion chamber and diaphragm for actuating the control



Low Pressure Control Valve.

valve. The gas is carried from the expansion chamber by a pipe line, ⅜ in. external diameter, to a gas control valve connected to the carburetter of the engine.

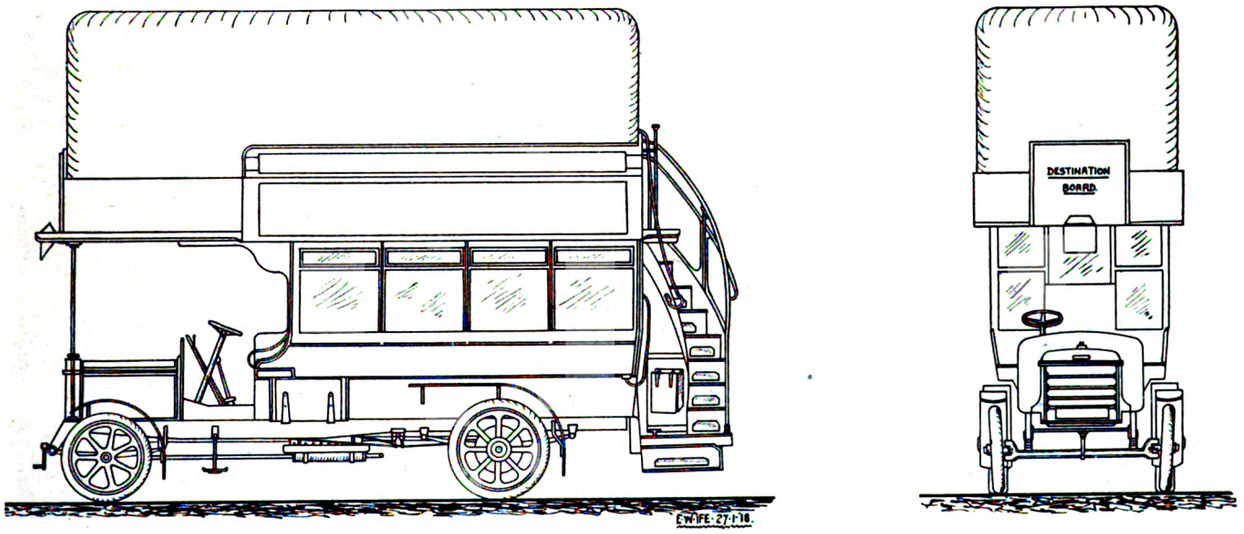
When the expansion chamber is fully expanded, it actuates the valve spindle of the secondary control valve, cutting off the supply which is diverted through a by-pass pipe into the diaphragm chamber of the reducing valve. This cuts off the main high pressure supply. Immediately gas is emitted from the engine control valve the expansion chamber becomes deflated, and releases the secondary control valve, which in turn releases the pressure on the diaphragm of the reducing valve and allows for the continuance of the supply from the high pressure storage. The whole system is thus entirely automatic, and calls for no manipulation or adjustment by the driver, who has merely to operate the foot pedal used in conjunction with the ordinary petrol carburetter. In case of emergency a small anxiliary petrol tank is fitted, and the standard petrol carburetter is retained. To change over, it is merely necessary to engage a small sliding dog to whichever throttle lever it is required to operate for running the engine on either liquid or gas fuel.

The distinguishing feature of the equipment is that it is a combination of the high-pressure and low-pressure systems. While introducing the gas at high pressure and passing it out at low pressure, a means of expansion is provided which is very necessary after compression.

To come to details of construction, each compressed gas cylinder is of 9 cubic feet capacity, giving a storage of just over 600 cubic feet at a pressure of 1,000 lb. per sq. in. Thus each omnibus will carry gas which at normal pressure would occupy 1,200 cubic feet. This is sufficient for 20 omnibus miles. The cylinders are tested to 4,000 lb. per sq. inch by hydraulic pressure, so that there is an ample margin of safety. They are of original design, and have been schemed out on principles consistent with general engineering practice. The body of the cylinders is of drawn copper tubing, 10 in. in diameter and 9 ft. in length. The copper body is fitted with steel end-plates which take the form of a spigot and faucet joint, making a cramping joint on a radius formed on the ends of the copper tubing. The end-plates are supported by longitudinal steel stays held in place by steel nipples which have a conical jointing. The outside of the cylinder body is wound with three layers of gun-steel tape, three-sixteenths in. by one-sixteenth in. section, put on under high tension on the same principle as gun winding. The object is to prevent bulging or sectional bursts. Any tendency to distort the cylinder under pressure will be in the form of elongation, the resistance to which is provided by the series of longitudinal steel stays. It is anticipated that copper tubing for the bodies of the cylinders will be replaced by steel tubing when war conditions have so relaxed as to enable the latter to be procured. The advantage of this will be the reduction of the elongation effect on the body, and consequent reduction of tension on the stays. There will also be a slight reduction in weight.

It is also to be noted that the valves embodied in the system have been carefully designed to perform the functions found necessary with gas storage. To allow for free movement at very light pressures stuffing boxes on the valve spindles have been replaced by grease seals, and the sealing reinforced by rubber rings inserted in the under side of the valve body.

Attention may be directed to the ingenious disposition of the apparatus, with the result that there is nothing in the way of external appearance to show that the omnibus is not an ordinary petrol-driven one. The reducing valve and the small petrol tank are under the driver's seat. The expansion chamber, which is a strong fabric container, is placed behind the usual front destination board above the hood. The box containing it is only about six inches wide from front to back. The bag is suspended in the box so that its weight has no effect on the automatic control of the gas supply.

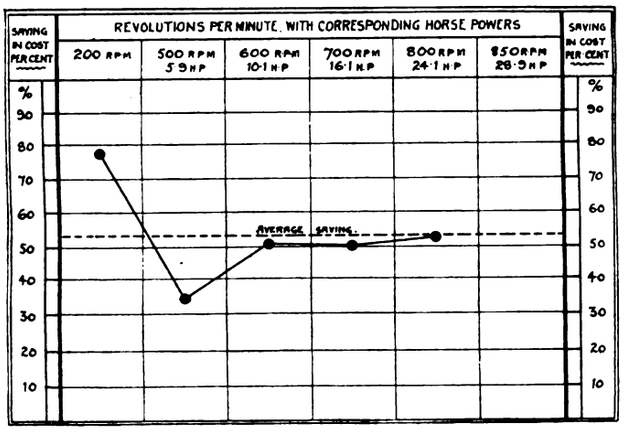


Showing the Appearance of an Omnibus with Gas Bag Sufficient for a 25-mile Run.

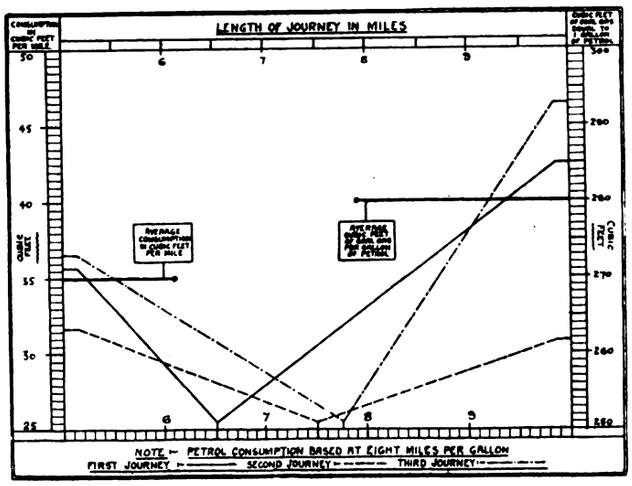
Digitized by Google

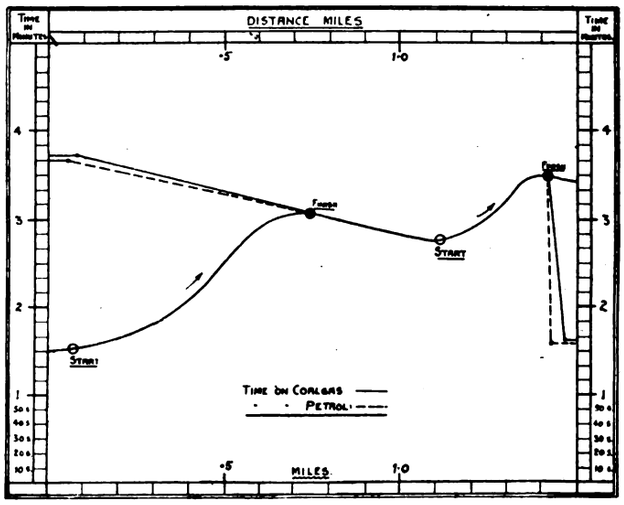
MOTOR TRAFFIC.

For charging purposes it is proposed to instal at the Cricklewood depot of the company a Reavell compressor of a capacity of 15,000 cubic feet per hour, connected to a battery of storage cylinders of approximately 30,000 cubic feet capacity, controlled by a hydraulic accumulator. The storage cylinders will be connected in parallel and cased in concrete. The hydraulic accumulator is employed to keep the pressure constant. The battery will be connected to a pipe line which will carry a series of charging pipes, from which several omnibuses can be charged at one time. This arrangement is shown diagrammatically in an accompanying drawing.



The change from petrol to gas power is being accompanied by a change in the method of lighting the omnibuses so converted. In general the company's vehicles are lit electrically, and for this purpose each omnibus is provided with a small electric generator driven off the flywheel of the engine, and with a storage battery. The weight of this apparatus is about 300 lb. The gas-driven omnibuses will be lit by gas, and the apparatus will weigh only 22 lb. Gas from the high-pressure cylinders is reduced to 10 lb. per sq. in. by means of a reducing valve and governor. Each





omnibus has seven incandescent gas lights, the mantles being enclosed in silicoe shades. There are two burners in the driver's cab throwing light into the interior of the omnibus; one is carried on the canopy of the driver's cab to illuminate the route number and the names of the destination points; two are on the dash-board; one is at the rear above the conductor's platform for illuminating the interior of the vehicle; and finally there is the red tail lamp. The gas is controlled by an injector system, which maintains uniformity of pressure and light, and the results are expected to be very good.

It was only after a long series of experiments and trials that an omnibus fitted on the system which has been here described was inspected and tested by the representatives of the Commissioner of Metropolitan Police. The accompanying diagrams give the results of various tests and are self-explanatory. The hill-climbing tests were made on gradients as steep as 1 in 9. It was demonstrated that the power obtained from the engine on this system with gas fuel was equal to that obtainable when petrol fuel is employed. It was also shown that it was impossible to exhaust the supply system when the maximum engine output was being developed. The high-pressure system kept up the supply as required. This disposes of the idea that less power can be got from gas fuel than from petrol.

It will thus be seen that there is every prospect of a thoroughly satisfactory system of gas propulsion for omnibuses. In appearance the vehicles, both externally and internally, are practically indistinguishable from the petrol-driven variety. The feed of gas is quite automatic. There is no additional mechanism for the driver to handle. The charging is even easier and quicker than the filling up of petrol tanks. The power is all right, and there is every prospect that reliability as proved by the test of time will be satisfactory. It cannot be expected that scarcity of gas will ever reach a point equal to the scarcity of petrol, and in any case the gas system is an addition to the existing method of petrol driving. Petrol omnibuses will still run, and there should be the more fuel available for them when a considerable number of the company's vehicles are running on gas.

The practical application at the present time of compressed gas to omnibus working is a valuable addition to national resources, and the London General Omnibus Company are to be congratulated on the successful results obtained from the painstaking and systematic investigations carried out by their engineering staff.

ELECTRIC OMNIBUSES FOR RIO JANEIRO.

The Brazilian Traction, Light and Power Company have obtained from the Commercial Truck Company, of Philadelphia, some electric accumulator omnibuses to be used on routes not served by their tramways in Rio Janeiro. According to particulars given by the *Electrical World*, of New York, the omnibuses are of the single deck type and have a seating capacity for 32 passengers. The vehicles are equipped with an Edison battery of 72 cells, with a rated capacity of 350 amperes hours. General electric motors are placed on each of the four wheels, the drive being through concentric gearing with a ratio of 12·14 to 1. With a full load on good level roads the vehicle can run thirty-five miles on a single charge, and with half the full complement of passengers, forty miles. Each omnibus can make twelve round trips of 2·26 miles during the day, giving a total daily mileage of 27·12, the running time being four hours, or twenty minutes per trip, with a total of twenty-four stops. During the tests the power consumption worked out at 294 ampere hours, the initial voltage of 89 dropping to 73 at the completion, the running time being 3 hours 59 minutes. At the start the battery temperature was 100° F., and at the finish 105° F., the air temperature being steady at 58° F. The omnibuses were run from Philadelphia to New York, a distance of about 150 miles, under their own power. On the first car the vestibules were packed on the chassis for shipment, the main bodies being packed in crates carried on the second chassis.

Digitized by Google

MOTOR TRAFFIC.

ASSOCIATION OF BRITISH MOTOR AND ALLIED MANUFACTURERS.

ITS VALUE TO THE MOTOR INDUSTRY.

Mr. Edward Manville was the guest of the evening at a dinner given by the Association of British Motor and Allied Manufacturers, at the Royal Automobile Club, on Wednesday, July 10. Mr. Manville, in addition to his numerous other important services to the motor industry, has until recently served as president of the A.B.M.A.M. He has lately been appointed president of the Association of Chambers of Commerce of Great Britain.

Mr. H. C. B. Underdown, the new president of the association, in proposing Mr. Manville's health, reminded his audience of the long period during which Mr. Manville had been a recognised head of the motor industry. He felt that Mr. Manville could congratulate himself upon what the association, under his presidency, had been able already to achieve, and had fitted itself to achieve in the future. He considered that all connected with the motor industry might well be proud of its achievements in the war. In spite of the difficulties and dangers which confronted the industry, he was optimistic as to the future. The motor industry was entitled to a considerable degree of support from the Government. The recently-issued report of Lord Balfour of Burleigh's committee showed a welcome recognition of this. He wished to sound a note of warning. On all sides one heard the cry for large outputs and a high degree of standardisation. Both were desirable, but they must not sacrifice quality to quantity. It was quality of manufacture which had made the British motor industry what it is.

Mr. Manville in his reply drew attention to the youth of the industry, and its early and successful efforts to organise itself. This organisation was rendered necessary by the difficulties which were put in the way of the use of mechanically-propelled vehicles. The first matter of importance was to overcome these difficulties, and this was work for manufacturers and traders of all nationalities. It had only comparatively recently become necessary to create a representative organisation to look after the British manufacturers' interests alone. Unfortunately in the past the Government had not assisted their industry to move in the van. They recognised now that the country must support its own industries and its own labour. Therefore the association of British and Allied Motor Manufacturers had been formed. Many good results had followed this development, which had been admirably supported. This association probably represented a greater percentage of the whole industry than any similar organisation formed in any other British industry. This fact was already realised by the Government, which showed a marked inclination to deal with the industry through its association. At least one department had taken this association as its model in defining the procedure to be adopted with regard to important problems connected with the rehabilitation of industry. With regard to the future, he shared the President's optimism. The general mental attitude was now fluid. There should not be the same difficulty as there was in the past in convincing people of the need of changing their methods. There should therefore be an immense demand for motor vehicles, especially with a view to the increase in efficiency of transport and business methods. It was a good omen for the future that the industry now receives the very active support of comparatively young men to whose hands its future could be safely entrusted.

Subsequently Mr. Bernard Caillard, the vice-president of the association, emphasised the need for pulling together, and Mr. Pullinger asked for due recognition of the technical side of the industry.

MUNICIPAL OMNIBUS EXTENSIONS.

POWERS GRANTED TO SHEFFIELD AND MORECAMBE.

The Local Legislation Committee of the House of Commons have passed the proposals in the Sheffield Corporation Bill to enable the Tramways Committee to run motor omnibuses to Catliffe and Treeton, to Chapeltown, High Green, and Grenoside by a continuation of the Ecclesfield service, and to Eckington by an extension of the Mosborough service. Opposition to the first and second proposals was offered by Rotherham Corporation, but ultimately the objections were withdrawn. Clauses were inserted in the Bill for the protection of West Riding County Council, Derbyshire County Council, and Chesterfield and Wortley Rural Councils.

After withdrawal of the clause to permit the running of omnibuses outside the borough, the Morecambe Corporation Bill has been passed as an unopposed measure, the Lancashire County Council having withdrawn their opposition.

TRANSPORT ACROSS LONDON.

ONE MILLION SOLDIERS ON LEAVE CARRIED BY THE MOTOR VOLUNTEER CORPS.

Since the formation of the City of London Motor Transport Volunteer Corps (Group 11), in February, 1915, to provide free conveyance across London for soldiers on leave, coming from or returning to France, over a million men have been so transported. The service thus rendered has been an immense boon to the gallant fellows, many of whom have since found a hero's grave, or have been incapacitated by wounds or sickness. The maximum number transported on any one night is 6,320. With their 90-lb. loads of kit, ten men go to the ton. Consequently the million men carried means transport of 100,000 tons. The actual carrying cost alone is given at 3d. per man. The personnel numbers 571, and the corps has available 73 commercial vehicles, 143 cars, and 45 sidecars. The corps property in vehicles comprises 12 lorries, 2 vans, and 8 cars. To augment the service the War Office is about to hand over 20 3-ton lorries. Five of the lorries were presents from the United States through the active work and organisation of Lady Lister-Kaye, wife of the O.C. The donors were the City of New York, Lieut. J. Cromwell, of Philadelphia, the City of Newport and Rhode Island, the State of California, and the City of Washington. A lorry was also presented by the Corporation and people of Glasgow and the West of England. It is urged that this example should be followed by other parts of the country, notably Lancashire, Yorkshire, and the Midlands, whose men benefit so largely from the service. The Imperial Tobacco Company, the Mincing Lane merchants and brokers, the Corn Exchange, Mrs. Angus, and Mr. Solly Joel also have made gifts of lorries, the last endowing his to the extent of £400 per annum. The corps, of which Major Sir John Lister-Kaye is the commandant, depends for its income entirely on subscriptions from the public, in money or in kind. The Earl of Cottenham is adjutant, and the Earl of Chesterfield chairman of Finance Committee.

WAR'S EFFECT ON THE A.A. & M.U.

Presiding at the annual meeting of the Automobile Association and the Motor Union, on July 9, Mr. Joynson Hicks, M.P., mentioned that although a large number of new members had been elected during the year, the organisation had suffered in membership during the four years of the war. When it again became possible to use cars, no doubt members would return. The income had been reduced by £10,000, and the expenditure by £13,000. During the year they had carried down to reserve £24,374, and the reserve fund had now reached such a total that when the war was over no motor organisation would have such a fighting fund ready to set to work in the interests of motoring as this organisation would possess. Motorists were now using their vehicles for the benefit of the community and to help the country in time of need. In this connection he read the following letter received from Sir J. Cadman, chief of the Petroleum Executive :—" Mr. Long would be much obliged if you would, on the occasion of the annual meeting of the Automobile Association, take the opportunity of thanking the motoring community for the sacrifices which they have so willingly made in the national emergency."

In referring to the bad condition of the roads, the chairman said that prior to the war they were proud of the roads, for none were equal to the best English roads. They were now cut up by military traffic. The association was determined that the roads be taken in hand and repaired as soon as possible after the cessation of hostilities. Motorists had been taxed very largely in order to establish a fund for the improvement of roads. When the war was over they would see that this fund was re-diverted for the purpose for which it was obtained.

Before the war they were in the hands of a petrol monopoly, which had grown more strict during the war. The executive committee of the association intended to encourage the production of benzol and the use of coal gas, and it was hoped that the Government would not stop their present experiments with regard to fuel suitable for motor traction after the war. In time of war taxation of luxury was justifiable, but it was a very grave question whether a motor car was a luxury. As cars were used to-day, he was of opinion that they were not luxuries. The views of the executive committee had been put very strongly before the Select Committee on Luxury Duty.

WOMEN'S WAGES AT BRADFORD.—Bradford Corporation have decided that the women tramway employees shall be given an advance of 3s. a week. This follows on the recent award made by the Committee on Production granting an advance of 5s. a week to men employees.

Digitized by Google

MOTOR TRAFFIC.

A QUESTION OF EXTRAORDINARY TRAFFIC.

ALLOWANCE TO LOCAL AUTHORITY FOR ROAD REPAIRS.

A question of extraordinary traffic in roads was the subject of an action in the Chancery Division of the High Court recently. The plaintiffs were Weston-super-Mare Urban District Council, and the defendants Messrs. Henry Butt and Company, Weston-super-Mare, quarry owners. The action, which extended over thirteen days—at the end of June and the beginning of July—was heard by Mr. Justice Eve, who delivered a reserved judgment on July 31. Counsel in the case were—for the plaintiffs, Mr. Macmorran, K.C., and Mr. J. Scholefield, and for the defendants, Mr. Maugham, K.C., and Mr. W. A. Jowitt. Plaintiffs claimed from the defendants £1,750, the amount of expenses incurred in repairing certain roads which they alleged were damaged by the extraordinary traffic of the defendants. Alternatively the plaintiffs claimed for damages for nuisance. The defendants denied liability, and said that the traffic which they had placed on the roads was not extraordinary.

His Lordship, in the course of his judgment, of which a full report was given in *The Times* of August 1, said that the defendants did not dispute that they were the persons by whose order the traffic was conducted, but they denied that it was extraordinary. Among other defences they raised one which involved the question whether ordinary traffic over a highway became extraordinary when the method of transport was so altered as materially to increase the cost of repairing the highway, or, in other words, was the increased cost due to the alteration in the mode of transport recoverable under Section 2 of the Highways and Locomotives Amendment Act, 1878, from the persons so using the highways, or did the obligation lie upon the highway authority to render the highway capable of sustaining the new method of transport without excessive wear and tear? The question was not capable of an answer applicable to all circumstances.

Coming to the facts, his Lordship said that down to August, 1913, the stone and lime brought from the defendants' quarry and the coal carried thither were transported in horse-drawn carts and wagons of a maximum weight of three tons or thereabouts. The total weight so drawn was large. Along the Bristol Road during the year ended March 31, 1913, it amounted to 13,524 tons, of which 12,108 tons passed also over Arundel Road. In August, 1913, the defendants began to use a steam wagon and trailer, and in the year ended March 31, 1914, when there were drawn over the Bristol Road 25,645 tons, of which 22,347 tons also passed along Arundel Road, 6,838 tons were transported over both roads by steam traction. In the year ended March 31, 1915, the total increased to 27,000 tons, of which 13,119 tons were carried by steam over both roads, and in the year ended March 31, 1916, when the total fell to 22,905 tons, there passed along the Bristol Road 15,046 steam-transported tons, of which 14,736 tons passed also over the Arundel Road. In January, 1916, a second steam wagon had been added.

TWO QUESTIONS.

On these facts the questions arose:—(1) Did the defendants impose extraordinary traffic on these roads where they adopted steam traction? and (2) if so, had that traffic ceased to be extraordinary and so far become ordinary traffic in the early part of 1916 as to impose on the plaintiffs the obligation of providing roads adequate to carry it? Although the answer to each question involved a finding of fact, there were authorities binding on him which indicated clearly what these findings ought to be. In Hill v. Thomas ([1893] 2 Q.B., 333) the Court of Appeal said that extraordinary traffic denoted a carriage of articles over a road at either one or more times which was so exceptional in the quality or quantity of the articles carried or in the mode or time of user of the road as substantially to alter or increase the burden imposed by ordinary traffic on the road, and to cause damage and expense thereby beyond what was common.

Proceeding, his Lordship said that an elaborate census of the traffic passing along the Bristol Road during the 25 weeks between May 1 and October 23, 1916, showed that the carriage of concentrated weight over the road was still exceptional, and virtually confined to the defendants, and in these circumstances it could not have ceased to be extraordinary traffic and become ordinary traffic between 1913 and 1916. There existed from August, 1913, conditions capable of giving rise to a claim under the statute of 1878. On February 19, 1917, the plaintiffs' surveyor certified that extraordinary expenses within Section 23 had been incurred by reason of damage to each of the roads, and on February 21 the writ was issued.

A LIMITED LIABILITY.

The object of Section 23, said his Lordship, was to ensure that a person using a highway for exceptional purposes should pay for any damage caused thereby, but by Section 12 of the Locomotives Act, 1898, the liability was qualified by an important limitation in that the action to enforce the statutory remedy must—with certain exceptions—be begun within twelve months of the time when the damage was done. The true effect of this limitation was that the authority could only recover for so much of the damage as was done within the twelve months preceding the issue of the writ, and if the injury had been going on for a longer period it became necessary to ascertain how much of the expense was properly attributable to those twelve months. He thought that as a result of the authorities it might be accurately said that *prima facie* the measure of damages was the difference between the sum expended in repairing the particular highway during the year, and the average sum expended on it in previous years. But obviously that could only be the *prima facie* method for ascertaining the damages, as there might have co-existed with the extraordinary traffic for which the action was brought the traffic and causes contributing to the necessity for increased expenditure, and the Legislature could not be presumed to have intended to impose on the person responsible for the extraordinary traffic any liability for increased expenses due to other causes.

THE CONCLUSION.

Considering plaintiffs' claim for each of the roads, his Lordship gave judgment for the plaintiffs for sums amounting in the aggregate to £280. His Lordship added that no case of nuisance had been made out. Not a single accident to any person had ever been reported, nor had any witness said that he was prevented from using either of the roads by its dangerous condition except one, whose evidence came to no more than that his chauffeur did not drive down Arundel Road because it was not safe. The plaintiffs had wholly failed to make out their allegations of excessive speed. Therefore the action failed on that issue, and he proposed, in giving judgment for the plaintiffs for £280, to order the defendants to pay the costs of the action excepting so far as they had been increased by the issue raised in paragraph 2 of the prayer of the claim, and to order the plaintiffs to pay the defendants' costs, so far as they had been increased by that issue, with the usual directions as to set off.

COMPRESSED GAS FOR OMNIBUSES.

GAS TRACTION COMMITTEE'S ANNOUNCEMENT.

The Gas Traction Committee (the Petroleum Executive, 12, Berkeley Street, London, W.1) have announced that the following arrangements have been made, pursuant to Section 17 of their interim report, in respect of the Metropolitan area:—

(1) The Commissioner of Police of the Metropolis has approved the issue of licences for 20 motor omnibuses equipped to run on compressed coal-gas;

(2) The necessary authority has been obtained to conduct trials with 20 goods-carrying commercial motor vehicles equipped to run on compressed coal-gas;

(3) The Petrol Control Department of the Board of Trade has sanctioned the issue in due course of the requisite gas permits;

(4) The Coal Controller has concurred in respect of an agreed maximum total volume of gas on the understanding that the supply might have to be cut off during the winter months if the exigencies of the gas position demands this course.

Section 17 of the report referred to above reads as follows:—

It is desirable to encourage forthwith, under special licence from the Board of Trade where necessary, a limited number of experiments on a commercial scale with compressed gas in rigid metal cylinders, plain or wire-wound, at pressures up to at least 1,800 lb. (120 atmospheres) on the square inch, in connection more particularly with certain of the larger motor omnibus undertakings and the transport departments of certain of the more important municipal authorities, in order to obtain data for dealing with this post war development.

Mr. G. J. SHAVE, of the London General Omnibus Company, Limited, has been added by the Gas Traction Committee to the expert sub-committee which is considering the use of gas for traction.

Mr. FIELD, sales manager of Commercial Cars, Limited, Luton, has been appointed to the Advisory Committee of the Road Transport Board for the Eastern Area. Mr. Field's experience in connection with Commer cars should be of exceptional value in the work of the Committee.

Mr. ALBERT BROWN, of the well-known firm of Brown Brothers, Limited, Great Eastern Street, London, motor factors, has been elected President of the Society of Motor Manufacturers and Traders. For many years Mr. Brown has occupied a leading position in the motor industry, having been vice-president of the Society for some time past and also president of the Motor Trade Association and the Cycle and Motor Trades Benevolent Fund.

Digitized by Google

MOTOR TRAFFIC.

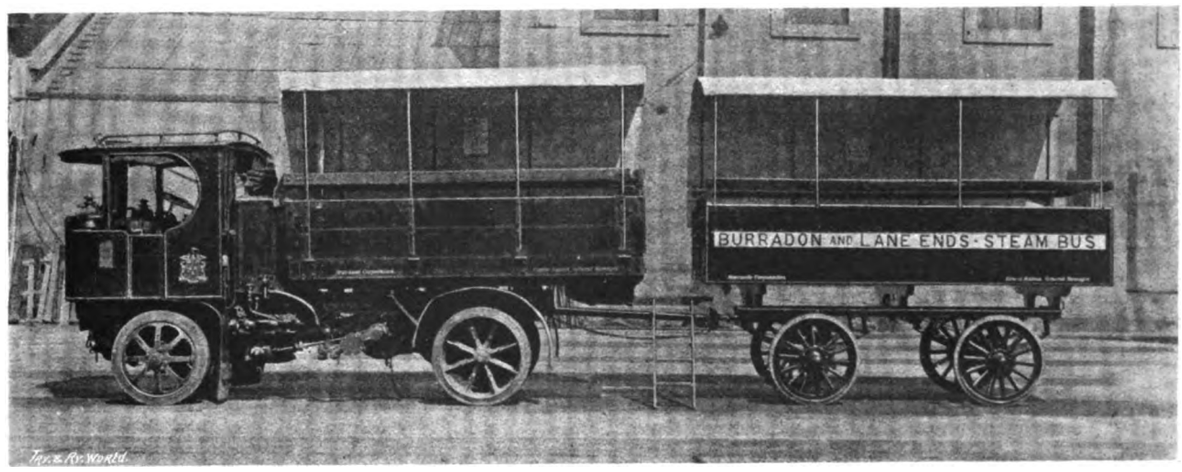
STEAM WAGON AS AN OMNIBUS.

NEWCASTLE MINERS CARRIED AT LOW COST.

Newcastle's teeming population has often benefitted from the inventive genius of Mr. Ernest Hatton, the general manager and engineer of the Corporation tramways and motor omnibus undertakings. Among his innovations, designed to meet the great increase of industrial traffic along the banks of the Tyne, was the conversion of single-deck tramway cars into conveyances for standing passengers only. This successful move has already been described and illustrated in these columns.

The most recent contribution of Mr. Hatton's ingenuity to the urgent demands for local transport is shown in the illustration above of an old-type "Sentinel" steam wagon which has been transformed into an omnibus, and is used for drawing a trailer. Both vehicles are utilised for the transport of the population of a district inhabited principally by miners. Although their use is needed only at week ends, the vehicles have been running long enough to render specially notable the low cost of fuel as against petrol, even at the pre-war price.

Mr. Hatton has taken this step entirely as a war measure, rendered necessary by the difficulty or impossibility of obtaining any other kind of vehicle, and his resource may prove useful to managers of other traction undertakings who may have one of the machines of the Sentinel Wagon Works, Limited, or any other steam wagon that can be spared one or two days per week from its accustomed industrial use.



RESTRICTION ON TAR SPRAYING.

In many London and provincial districts there has been unrestricted use this summer of tar for the spraying of the roads. According to the Road Board this is "contrary to the conditions of the sanction for the use of tar." This announcement was made by the Board in answer to a request from Islington Borough Council for the supply of tar to be used for spraying three macadamised carriageways used by motor omnibuses.

The communication from the Board continued :—"Owing to the quantity of tar available for road purposes during the present year being very much restricted, its use is only permitted on roads which are of national importance. The unrestricted use of tar on unimportant roads in London areas is likely to raise serious questions between the Board and the Ministry of Munitions under whose licence permits are issued, and the Board must ask you to be good enough to immediately stop the use of tar on roads which are not subjected to traffic of military or commercial importance, and to reduce the quantity allowed under licences granted to the absolute minimum. Tar must not be used merely for the amenities of dustlessness."

FIRST AID INSTRUCTION is now being given to women conductors of the London General Omnibus Company. Such instruction has previously been given to men only, but it has been found women conductors can be relied upon to make effective use of similar training.

MOTOR VEHICLES FOR MUNICIPALITIES.

CUPAR CORPORATION has decided to purchase a steam motor tractor.

NEATH RURAL DISTRICT COUNCIL is about to purchase a steam wagon for use in the highways department.

WORTHING CORPORATION has failed to obtain a priority certificate for the purchase of an electric refuse collecting van.

STOCKTON RURAL DISTRICT COUNCIL has received the sanction of the Local Government Board to purchase a steam wagon.

WORCESTER CORPORATION has approved of the suggested purchase of another motor wagon for use in the electricity department.

HAMPSTEAD BOROUGH COUNCIL has purchased a Ford van for use in connection with the National Kitchens established in that area.

STIRLINGSHIRE COUNTY COUNCIL has under consideration the question of steam haulage. A committee has been appointed to deal with the matter.

ILFORD URBAN DISTRICT COUNCIL has given instructions to the engineer to inquire into the relative merits of steam, petrol, and electric vehicles, and to bring up a report thereon.

FINCHLEY URBAN DISTRICT COUNCIL has under consideration a recommendation from its Public Health Committee for the purchase of a motor car for the use of the medical officer.

SHEFFIELD CORPORATION has approved of an arrangement proposed by the Health Committee whereby two British-built electric chassis are purchased instead of those on order.

CORNWALL COUNTY COUNCIL at its last meeting adopted a report from the Finance Committee recommending the purchase of a motor car for the personal use of the County Surveyor, at a cost of £350.

NORFOLK COUNTY COUNCIL has received a report from the County Surveyor to the effect that he has satisfied himself that steam haulage is far more economical and expeditious than horse haulage.

HOVE CORPORATION has accepted the tender of Thos. Tillings, Limited, for the supply of four steam wagons at a charge of £4,293 for one year. This charge represents an increase of 15 per cent. upon the old contract rate.

SOMERSET COUNTY COUNCIL has under consideration a report from the County Works Committee on the question of reconstruction and transport. Included in this report are the replies from the District Councils suggesting the provision of a number of road motor services.

WESTON-SUPER-MARE URBAN DISTRICT COUNCIL has for some time past had under consideration the purchase of a motor fire engine. The Surveyor has now to make inquiries as to the possibilities of securing a suitable machine, and bring up a report at the next meeting of the Fire Committee.

GLOUCESTER CORPORATION has been considering a suggestion from the Chief Constable that his work could be more efficiently performed if he were supplied with a motor car. The Finance Committee, however, is of the opinion that the present is not an opportune time for making a departure of that character, and recommend that the matter be postponed for twelve months. This view has been accepted.

Digitized by Google

MOTOR TRAFFIC.

MOTOR TRAFFIC NOTES.

HOUSING OF POPLAR MUNICIPAL MOTORS.—At a cost of £1,254 the Poplar Borough Council propose to erect a garage for their motor vehicles.

COST OF ENERGY FOR ELECTRIC VEHICLES.—In consequence of the increased cost of coal, etc., Walsall Corporation have raised the price of energy for electric vehicles by 20 per cent.

PETROL SHORTAGE AT SHEFFIELD.—Owing to the shortage of fuel and the difficulty of obtaining drivers, the Upperthorpe motor omnibus service of the Sheffield tramways has been discontinued.

SALE OF DISCARDED ARMY TIRES.—In the House of Commons, Sir Worthington Evans stated that the Ministry of Munitions were prepared to consider the question of the sale of old army tires for retreading if the price obtained would justify the expense of sorting.

PASS THAT PERMITS EXCESS SPEED.—At the hearing of a summons against the driver of a motor vehicle, heard in a London police court on July 4, it was mentioned that "Z" passes issued by the Government allow the holders to drive at a reasonable speed exceeding the legal limit of 20 miles per hour.

THE PIONEER SWEEPER.—Liverpool Corporation have purchased from Messrs. F. Walters and Company, Bilton, Rugby, the Pioneer simultaneous sweeping and loading machine that created so favourable an impression on the occasion of a demonstration during the recent London conference of the Municipal and County Engineers.

PUBLIC VEHICLE RESTRICTIONS.—No public vehicle constructed to carry more than six persons, including the driver, may in future be used for pleasure or other purposes, according to a Board of Trade Order issued on July 21. Exceptions are made in the case of public omnibuses running in the interests of the travelling public, the conveyance of hospital patients, and "cases of urgent necessity."

U.S.A. GOVERNMENT HIGHWAYS COMMITTEE.—At Washington there has been organised the Government Highways Committee. It is under the chairmanship of Mr. Logan Weller, director of public roads in the Department of Agriculture, and comprises representatives of the War Industries Board, the Fuel Administration, the Highways Transport Committee, the Department of Agriculture, and the Army Motor Transport Service.

OMNIBUSES ON TRAMWAY ROUTES.—Replying to a question by Mr. Gilbert in the House of Commons, Sir A. Stanley, President of the Board of Trade, stated that four omnibuses had been withdrawn from the Sunday service in the Croydon district, and nine in the Ilford district. The omnibus companies had been requested not to increase their services on tramway routes, where, to secure economies in the consumption of fuel, tramway services were reduced.

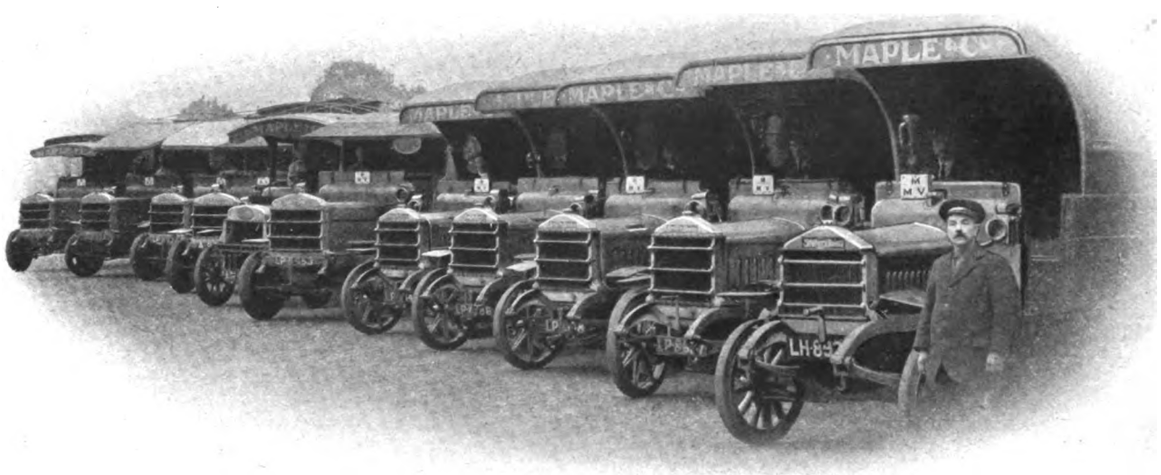
COMMISSIONER OF POLICE AND OMNIBUS QUEUES.—Kensington Borough Council have received a letter from the Commissioner of Police for the Metropolis stating that he is anxious to give a trial to the formation of queues for omnibus passengers. It is impossible, however, he states, to detail police to regulate the queues if such a system were carried out to any considerable extent, except by the augmentation of the force, which would entail additional cost to the ratepayers.

TRACTOR TRAINS LESS HARMFUL TO ROADS.—An interesting claim that might engage the attention of Colonel Crompton, the expert on motor vehicles and road wear, is advanced in connection with the inauguration of a Walter tractor train service between Detroit and Toledo. The tractors leave each city twice daily, and draw two 5-ton trailers. The operating company maintain that the tractor trains are less harmful to road surfaces than ordinary 5-ton motor trucks loaded, because of the even distribution of weight.

RAILLESS CAR AS A KITCHEN.—Halifax Food Committee have arranged with the Corporation Tramways Committee to equip a railless trolley vehicle as a travelling kitchen at a cost of £252. This step has been taken in consequence of the success that has attended the equipment of a tramway car as a kitchen for the supply of meals to the public. Owing to the shortage of fuel for propulsion, it is anticipated that considerable difficulty will attend the carrying out of the proposal of Alderman Spencer, the Director of National Kitchens, to utilise motor omnibuses in various towns for the same purpose.

A FLEET OF STRAKER-SQUIRE VEHICLES.

A fleet of Straker-Squire vehicles illustrated on this page represent a portion of Messrs. Maple and Company's (Tottenham Court Road) fleet, lined up with their staff. The whole of these machines are on motor volunteer work, and are being used exclusively on work of the greatest national importance. They are accomplishing the most arduous work, including very long-distance runs, indeed there is probably no more severely worked fleet of machines in the metropolis. When motor vehicles were first introduced to the public some 18 years ago as a freight-carrying possibility, they were purchased experimentally in ones and twos, and as their value for fast traffic purposes became apparent, Messrs. Maple used their slowly accumulated experience of a variety of makes to single out the best types, as they revealed themselves particularly suitable for all-round work.



A Fleet of Straker-Squire Vehicles.

Situated as Messrs. Maple are, in the very heart and centre of London, and all their departmental chiefs being enthusiastic motorists themselves, the firm were in a particularly favourable position to examine the claims and reputation of every type of vehicle on the market, and to test it as to its suitability for arduous work.

MOTOR TRAFFIC AND ROAD MAINTENANCE IN VICTORIA.—A conference of inter-urban Councils held at Melbourne has decided to seek an amendment of the Country Road Boards Act in order to secure the following objects:—The Board to determine the proportion of motor and ordinary traffic on all declared main roads where extraordinary maintenance charges are incurred by reason of motor traffic; funds from motor fees to be applied to construction and maintenance of declared main roads for the benefit of motor traffic; motor fees to be increased to cover the road charges due to motor traffic; the maximum speed to be at the rate of 25 miles per hour.

Digitized by Google

THE Tramway & Railway World
WITH MOTOR TRAFFIC SECTION

Founded 1892. LONDON, SEPTEMBER 12, 1918. VOL. XLIV.

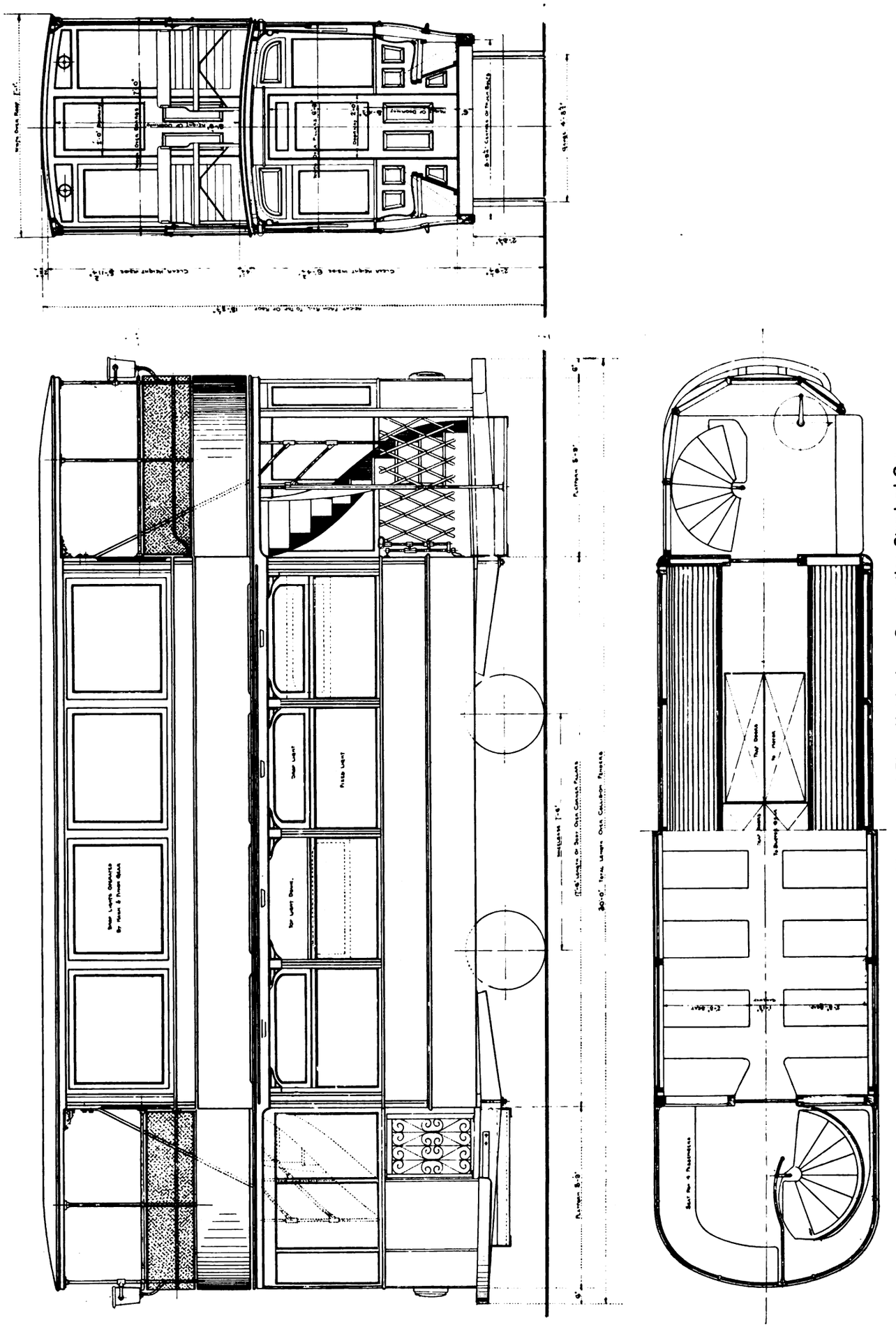
NOTTINGHAM CORPORATION STANDARD CAR.

The accompanying illustrations show the type of car that the Nottingham Tramways Committee adopted in 1914, on the advice of the general manager, Mr. J. Aldworth, as their standard car. Twenty of these cars have been put in service since the outbreak of war, and as soon as circumstances permit the number will no doubt be increased, for in Nottingham, as well as in many other towns, the present rolling stock has become inadequate to meet the demands of increased traffic. The new cars are in every respect thoroughly good examples of the best work of British builders, and the Tramways Committee are well satisfied both with the construction and the design, while the public find the cars convenient and comfortable. The interior is light and well ventilated, and owing to the arrangement of the windows and the pattern of the ceiling gives an effect of spaciousness that is agreeable to passengers.

A comparison of the standard car with the car originally adopted in 1901, when the Nottingham Corporation electrified their tramways, gives a good idea of the changes effected in the design of four-wheel cars in this country during the past twenty years. At the end of the last century the development of car design for electric tramways for city and suburban services was practically stationary, and the car then selected for Nottingham was typical of those that continued to be built for many years afterwards, and are still in use in many towns. When describing the Nottingham car of 1901 in our issue of February 7 of that year, we said:—"This country has gone to America for nearly all its precedents in tramway equipment, but it refuses to be led by American practice in its adoption of single-deck cars. The advantages of the double-deck car in this country are easily understood. It deals with the separation of smokers and non-smokers; it doubles the seating

Nottingham Corporation Tramways Standard Car.

Digitized by Google



Elevation and Plan—Nottingham Corporation Standard Car.

Digitized by Google

capacity with comparatively small increase in weight; it is more popular than the single-deck car with the public; and the public in this country must have what it prefers." For these reasons the Nottingham cars were provided with seats on the upper deck, which, of course, were then uncovered. Single trucks were used because it was felt that short cars were best adapted to local conditions.

That the type of car then selected well met the requirements is proved by the fact that the new standard cars are also double-deck, single truck cars. In details, however, they differ greatly from the earlier cars. The top deck is now covered, and the platforms are enclosed with vestibules. The general appearance of the car has gained much. It is more substantial and solid, without being more heavy looking. An element in producing this effect is no doubt the scheme of the window framing.

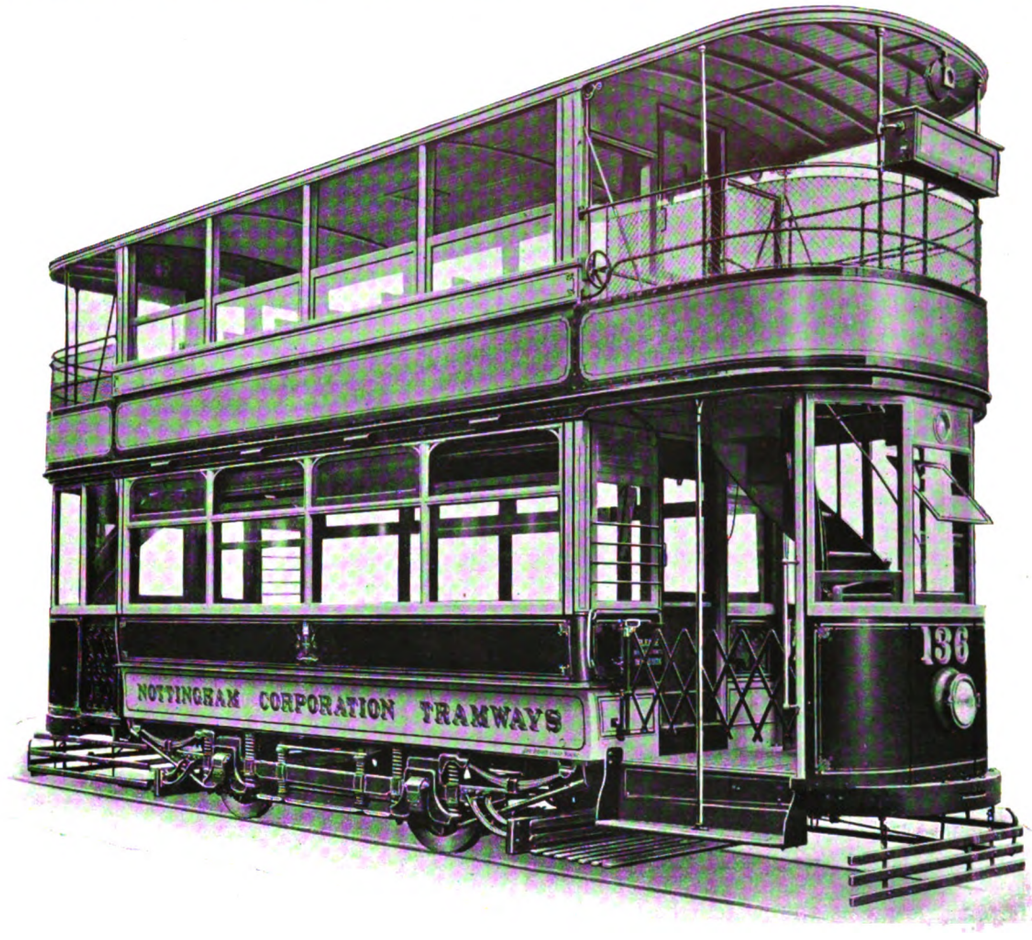
The car shown in the accompanying drawing was supplied by Dick, Kerr and Company, and was constructed at their car works at Preston. The body is mounted on a four-wheel Preston truck, and is fitted with 32½ in. wheels. The principal dimensions of the body are as follows:—

Total length over collision fenders	30 ft. 0 in.
Length of body over corner plates	17 ft. 6 in.
Height from rail to top of roof	15 ft. 8½ in.
Clear height inside lower saloon	6 ft. 4¾ in.
Clear height inside upper saloon	5 ft. 11¾ in.
Width over roof	7 ft. 1 in.
Length of platform over buffer	6 ft. 3 in.
Wheel base	7 ft. 6 in.
Gauge	4 ft. 6½ in.
Width between centres of truck bolts	5 ft. 9¼ in.

The cars are provided with Tidswell life-guards, Philipson side guards, and the Spencer-Dawson power brake. Motors and controllers were manufactured by Dick, Kerr and Company; the former are the standard D.K.9A-3 type, and the latter the D.B.L.K-3 type.

The whole of the framing is of teak, and the body is fitted with specially designed steel braces, which prevent the joints from working loose. The windows, as shown in the illustrations, are in two parts, the upper portion being movable so that it can be lowered as required for ventilation.

The car has a seating capacity for sixty-four passengers. In the upper saloon, arranged on either side of a centre aisle, are eight transverse seats, each accommodating two passengers. The lower saloon has longitudinal seats, each accommodating twelve passengers and divided into two sections by means of a brass rail, which assists the conductor in getting the full number of passengers seated.



Nottingham Standard Car—View Showing Movable Windows in Vestibule.

As will be seen from the illustrations, the driver and conductor are fully protected from the weather by well-lighted vestibules. The window in front is pivoted in the centre, so that it can be set at any angle convenient to the driver. While there are various opinions as to the use of vestibules, the objections originally made to them have been proved more imaginary than real, and there is no doubt that especially in inclement weather drivers find them an advantage.

The cars are fitted with illuminated route numbers placed over the end destination indicators. Numbers are also placed on each side of the cars in the side windows, and these are found to be very serviceable.

Digitized by Google

TRACK MAINTENANCE AND ELECTRIC ARC WELDING.

Electric arc welding passed out of the experimental into the practical stage many years ago, but, in spite of this fact, the subject is still rather vague to many engineers. Electric welding plays a most important part to-day in the manufacture and repair of many articles, and is largely used for track repairs by many important tramway undertakings. Engineers have previously hesitated to adopt electric welding, because they failed to see its advantages, and doubted its efficiency. They did not fully appreciate that by installing a small plant they had at their command a ready means of carrying out repairs on their track which had previously been beyond their power. They further, no doubt, thought that the plant and apparatus employed were complicated and required extreme skill in handling, and they further thought that the amount of benefit gained would not be sufficient to justify the outlay.

The object of this article is to show that the process is simple, and can be carried out by ordinary labour, whilst the repairs are efficient and effected at small cost; that the saving is considerable, and that a plant once installed can be considered a paying investment.

If the track is allowed to fall into a bad condition, the faults are further transmitted to the rolling stock. The shocks and jars given to the truck frames by a badly-worn track cause many a car to be laid up in the repair depot for days. Nuts are shaken loose, hangers and brake fittings are thrown out of adjustment, and many other faults develop which would ordinarily be avoided.

Even if new rails were procurable, it is doubtful if the present labour conditions would permit of extensive track repairs, and these conditions will not terminate with the cessation of hostilities. They are bound to continue for a considerable time after the war, and this fact should be borne in mind in reviewing the general aspect.

Electric arc welding has been extensively used by the shipbuilding and general engineering trades for many years Various systems are in use, but the "E. & E." system has been perfected and the makers claim many advantages for it. There are two principal systems in common use, the low pressure alternating, or Thompson system, and the electric arc. The former is largely used in manufacturing processes, but nearly always requires large transformers and costly clamping devices. The electric arc is the system best adapted for track and rail repairs, and this is again divided into two methods. The first consists of using a metal rod as the electrode, and is without doubt the system which finds most application in track work. The other method consists of using a graphite electrode, from which the arc is struck to the rail. This, of course, does not provide any new metal, so this must be fed to the arc by means of a metal bar. The graphite electrode is usually employed for cutting and filling. The former has the advantage that the carbon contents of the steel rail are not interfered with, as they may be with the graphite electrode. This, however, can be avoided by the selection of pure graphite electrodes, and by carefully observing that the current is flowing in the right direction.

Various types of metallic electrodes are provided for use upon different classes of rails; for instance, electrodes of manganese steel can be used for the repair of crossings or points made of that metal. The application of the arc can easily be understood by the illustration here shown.

Fig. 1 shows a worn rail joint, inside section, where the original conditions can be seen by the dotted line AA. Traffic passing in the direction of the arrow has the effect of wearing the facing end of each rail, this being due to the fall or hammer of each wheel as it drops from the preceding rail at the gap. When the hammer once starts it rapidly increases, as obviously the fall becomes greater. Here the object of the welder will be to restore matters to their original state as far as possible. He, therefore, strikes an arc upon the

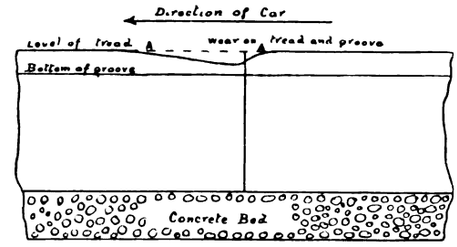


Fig. 1.

face of the rail with a metallic electrode, and deposits metal until the surface is somewhat higher than that required. If necessary, the metal can be applied in successive layers where the depression is very deep, but in such cases the operator must be careful to remove the slag from the first layer before the second is applied. The slag is formed in a thin black coating of hard silicate scale. It can be removed by chipping and this is best carried out by one of the special hammers provided for the purpose, the loosened scale being afterwards removed with a wire scratch brush.

When the whole of the metal has been deposited, the joint will appear as shown in Fig. 2. In this illustration the wavy method of depositing the metal will be seen. This mode of working the electrode is the practice regarded as most successful.

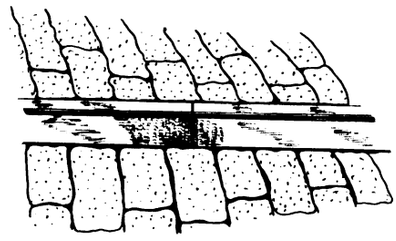


Fig. 2.

While the newly-deposited metal is still hot, it should be hammered carefully. This will assist in making the deposit more homogeneous and prevent sponginess. When the joint is cool it can be dressed to the correct level. The joint is finally surfaced by means of a rail plane or rail grinder of the "Celerity" type. Where necessary for special repair work, manganese electrodes can be used to great advantage.

This method of surface repair is, of course, not suitable in cases where the rail ends have already worked loose, and the foundation become damaged. To leave such a joint with a mere surface weld would only result in the newly-deposited metal fracturing under the first car. It is necessary in such cases to remove the side sets and attend to the packing of the damaged foundation. This done, the surface weld can be carried out in the manner described. As the sets have been removed, advantage can be taken to deposit new metal at the base of the rail, and the fish plate can also be secured by a layer of metal, deposited along its edges.

Digitized by Google

The repairing of damaged checks provides a large field for electric arc welding. Fig. 3 shows one method of carrying this out. The illustration shows the section of a rail, where the groove has worn badly in the check, so that it has either cut through at places or become so badly cracked as to court accident. The first process consists of cutting out entirely the faulty check. This can be accomplished by cutting it away with the electric carbon arc. This is a quick method but requires some care or the metal may descend into

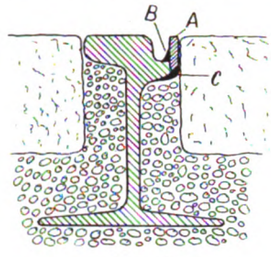


Fig. 3.

the base of the rail groove, where it is hard to remove. Graphite electrodes are used in this case, as there is no metal to be deposited.

The new check which consists of a length of steel bar, is then placed in position, as shown at A in Fig. 3. It must be packed in position, so that the top corresponds with the original check. Metal is then deposited at B and C. In the latter case it will be seen that the metal has to be built up above the arc. This is termed overhead welding, and is carried out by metallic electrodes having thicker flux coatings than those used for downright welding. The object is to prevent the molten metal falling from the tip of the electrode by the thicker sheath.

The repairs at junctions and crossings are easily carried out by the electric arc, for here it is the simple depositing of metal in worn grooves and tongues. Care is, however, necessary to make the deposit even and keep it off the adjoining surfaces, so that smooth

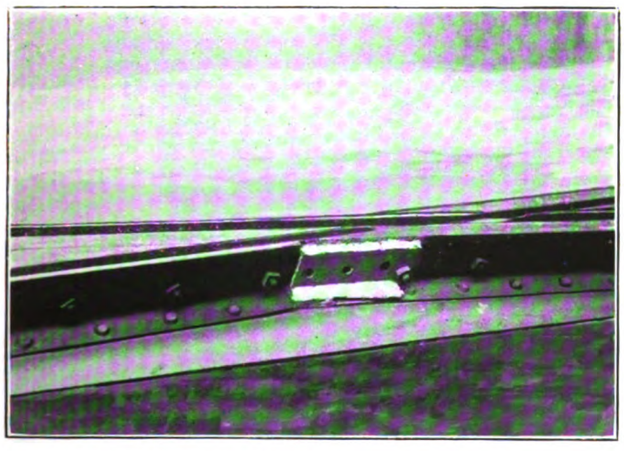


Fig. 4.—Rail Crossing Repaired by Arc Welding.

running may be secured. The spongy ends of points are easily corrected by this process, thus solving what has hitherto been a great trouble on many tramways.

The above show only a few of the many repairs which may be effected, but instances will readily suggest themselves to the engineer owning a welding plant.

The plant employed for arc welding is simple and requires no great skilled attention for its operation. Briefly it consists of a motor generator suitable for welding. The motor is wound to operate upon 500 to 550 volt circuits. The current is taken from the trolley wire by means of a pole and hook connection, where the welding set is mounted upon a lorry or wagon. If the set is mounted upon a repair car, the ordinary boom circuit can be used to collect the supply.

The generator is, as a rule, specially designed to withstand the heavy work of welding. The load may vary from zero to 50 per cent. overload in a few seconds. There are, however, other considerations to be met, and it is advisable always to adopt the special machines now put on the market by the makers for the purpose.

The voltage required by the arc is approximately 50 for the carbon arc, and 25 to 35 for the metallic electrode. The voltage, however, varies according to the thickness of flux covering and the kind of repair being effected. It is, however, necessary to include in the arc circuit a resistance which acts as a steadying device, limiting the current in the event of a dead short circuit or when the arc is struck. The resistance must be arranged for ample carrying capacity and free ventilation, on account of the long periods which it may be in circuit. The actual regulation of current is also obtained by means of a shunt regulating resistance in the generator field circuit.

The current required in welding arcs varies from about 35 to 200 amperes when metallic electrodes are in use, and up to 250 to 400 amperes with carbon electrodes. This is for portable sets, as used upon track repairs, and is usually ample for the purpose. For metallic electrodes there is a scale of current values for each size electrode. These must not be exceeded or the metal is blown from the end of the rod rather than quietly deposited. The size of the electrode used depends upon the thickness of the work and the extent of the weld.

The whole of the plant can be carried either upon a lorry or upon a repair car. In the former case, the set can be used for rail repairs in the daytime, without interfering much with traffic. The repair car which, of course, occupies the rails can only be used at night. The welding work is easily learnt by any skilled and intelligent workman in a few weeks. It requires a little skill to deposit metal neatly and free from flaws. This can be best obtained by experience and practice in the depot upon scrap material. Men who have been accustomed to oxy-acetylene welding, readily become expert in the use of the electric arc.

The time occupied in repairing and grinding off a single joint is approximately one hour and the amount of current used is 2·8 units. These figures were obtained from actual tests. With an operator and assistant, the actual cost of the repair worked out at 6s. 6d. In this case, welding was only done by night, and as many as six joints were dealt with each night. The sections finished are practically equal to new rails, and the smoothness in running is appreciable.

The plant also finds many an application in the depot where all sorts of repairs can be dealt with. Worn holes in side frames and brake gear can be filled up solid with metal, and redrilled to correct size. Broken lugs can be replaced upon motor and gear cases, and hundreds of other applications will be found. In fact, much material previously discarded as scrap can be reclaimed and made serviceable again For much of the information contained in this article we are indebted to the Equipment and Engineering Company, of 2–3, Norfolk Street, Strand, W.C.2.

Queues in Contemplation.—Liverpool Corporation Tramways Committee have appointed several of their members, with the general manager, to visit towns where passenger queues have been introduced and to report with a view to obviating the present crushing at some of the principal points.

Digitized by Google

THE DICK-KERR-30 VENTILATED TRACTION MOTOR.

The conditions under which tramway motors operate are well known to be the reverse of ideal. Such motors owing to their location are necessarily of limited dimensions, and have to operate for lengthy periods without attention, and this despite the inherently dirty conditions of their employment below the car.

For this reason the totally enclosed type of motor has been very largely favoured by tramway engineers in the past, as being practically dustproof and watertight, although total enclosure naturally reduces the continuous rating of such a machine owing to temperature limitations, due to the difficulty of dissipating the heat generated in the motor.

Many of the difficulties associated with the design and operation of tramway motors would be obviated if a really satisfactory system of ventilation could be provided, and with this object in view Messrs. Dick, Kerr and Company, Limited, have recently placed on the market a positively ventilated type of traction motor, which embodies all the features which the firm's long experience in this class of apparatus has shown to be essential to successful operation, and will strongly appeal to those engineers who favour the ventilated type of motor.

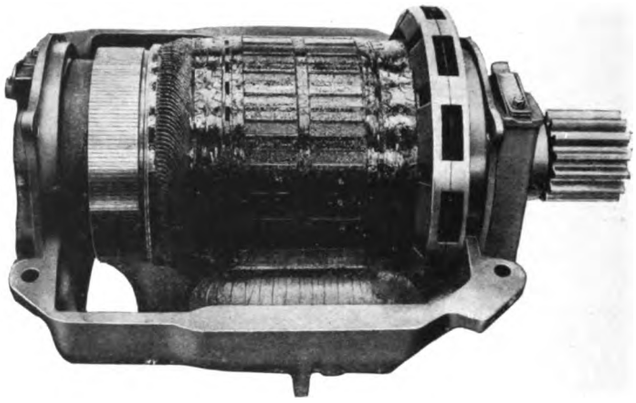
This machine, known as the D.K. 30, is of the interpole type and in general design follows the firm's

The D.K.-30 Traction Motor.

standard practice. It is, however, supplied with either a split frame (as illustrated) or box frame, which latter construction is now finding favour, particularly abroad. The frame itself is of high permeability cast steel, fitted with separately cast armature bearing boxes on either side, which are firmly bolted to the frame. This gives a very rigid construction, and one which facilitates dismantling for inspection, as the armature can be retained in position while the bottom half of the frame is removed or can be removed with it if necessary. The solid armature bearing boxes are also an effective preventative of oil creepage into the interior of the shell.

The main pole pieces are built up of laminated steel punchings, rivetted together, and are interchangeable and fitted with former wound coils; these coils are specially insulated to withstand moisture and high temperature conditions, and are firmly held in position by flat steel springs, by means of which any shrinkage of the coil is automatically taken up. The interpoles are solid steel, with field coils clamped in position by screws. The armature is of the firm's standard construction, special air ducts being provided in the case for ventilation purposes. To ensure that this ventilation is satisfactory and positive, a double flow exhaust fan of compact form is fitted to the armature which draws one current of air through the armatu e laminations, and another air current over the field coils.

This air enters the motor casing through inlets of considerable area, which are located behind the commutator lid, where they are protected from dust and

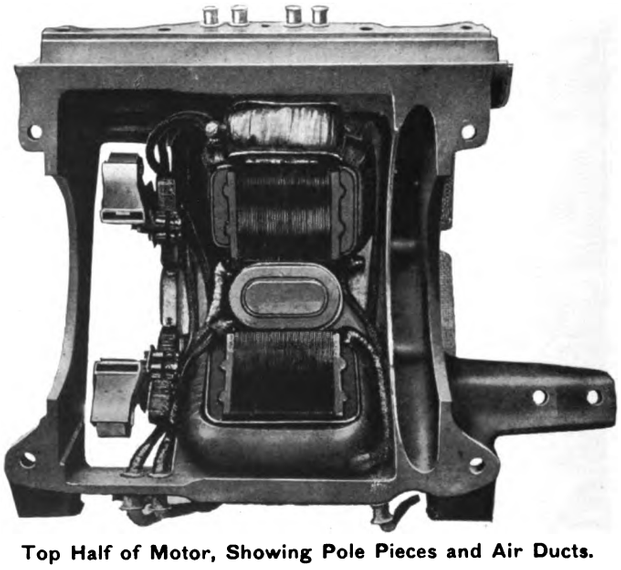


Armature with Double Flow Fan.

water, and is discharged through outlets at the pinion end, in a similarly protected position. Both the air inlets and outlets are fitted with coarse protective screens, shaped so as not to restrict the volume of air entering or leaving the air ducts.

The volume of air and its velocity are such that any dust entering the casing is carried right through and expelled, an operation which the smooth direct air passages greatly facilitates, as also the fact that no reversal of direction of air currents occurs in the motor.

The cooling effect resulting from this positive system of ventilation increases the continuous capacity of the



Top Half of Motor, Showing Pole Pieces and Air Ducts.

motor to 70 per cent. of the one-hour rated capacity, as compared with a value of only 40 per cent. with the unventilated type of motor.

It is unnecessary to emphasise the value of this feature as it is obvious that in tramway operation the capacity of the motor for continuous operation during periods of eight or ten hours is far more important than its one-hour rating, and due to the cooler running conditions the life of the insulation is greatly increased,

Digitized by Google

as it is unlikely to suffer from the effects of overheating. Furthermore, owing to the improved utilisation of materials a greater output can be obtained for a given weight, or stated in another way, a reduction in weight to be hauled can be made which represents a material saving in cost of operation.

The bearings of the armature, as well as those for the axle suspension, are lubricated by means of wool waste and horse-hair saturated in oil, a special channel being cast in the bearing box for oiling. The motor is also adapted for ring lubrication, and owing to the oil storage capacity provided, the bearings will operate for long periods without attention.

The motor is fitted with the firm's standard brush gear; the axle is provided with a forged steel pinion cut from the solid, which meshes with a cast-steel gear wheel, the gearing being enclosed in a malleable iron case supported from the frame.

The D.K. 30 motor is designed for one metre gauge and is rated at 40 H.P., when operating on 500 volts at a speed of 520 revolutions per minute. It is claimed that it represents a great advance in motor designs, even of the ventilated type, both in efficiency and all-round reliability, and it is specially adapted for use under the conditions met with in British tramway operation.

ELECTRIC TRAMWAYS IN POLAND.

By ARTHUR E. GURNEY
(*Member Warsaw Engineers' Association*).

Since the inauguration, in 1908, of Warsaw's new tramways, the inhabitants of all the five principal Polish cities have enjoyed the advantages—not in every case unalloyed—of an electric tramway service. For although by far the most populous and important, Warsaw was the last of them to introduce electric traction in its streets.

The form of ownership and manner of exploitation vary considerably in the several towns. At the time war broke out the tramways of Lodz were the only remaining purely private undertaking, while those of Lwow (Lemberg) constituted the only completely municipal system, owned and worked entirely by the municipality. In Poznan (Posen) the tramways were still nominally a private business, but negotiations for their transference to the town were all but completed, whilst the tramways of Cracow were owned and controlled by a private company nearly all of whose shares had gradually been acquired by the municipality. The Warsaw tramways represent an unusual departure from precedent, for although the property of the town, they are worked by a group of capitalists under guarantee of certain minimum profits.

In the case of Cracow, the utility and profitableness of the service were further reduced by the circumstance that the cars were old-fashioned and uncomfortable, and the lines consisted of but a single track—a frequent cause of long stoppages. It is therefore not surprising that the average relative number of passengers carried daily was lower than in any other Polish city, amounting to less than one-sixth of the population. In this connection only the original Cracow, about three square miles in extent, with a population (in 1910) of 112,500, can be taken into account, as "Great Cracow," with its 152,000 inhabitants and area of 13 square miles had but recently been created by the inclusion of outlying districts, whose development had only just begun. There seems little doubt that in the near future, when the service is extended to the new areas, the whole system will be reconstructed. In 1910 the gross takings of the Cracow tramways amounted to £28,252, or £25 4s. per 100 of the city's inhabitants, and expenses to £20,367, leaving a net profit of £7,885, or £7 per 100 of the population. A tax levied by the municipality on the tickets sold realised £3,125.

The area and population of Poznan were both only a little larger than those of Great Cracow, but the tramway system was fully developed to serve the whole area. The proportion of the inhabitants who daily used the cars was only slightly higher than in Cracow, but the gross takings amounted in 1910 to £53,200 or £33 19s. per 100 of the population, and were more than double the amount received in 1901.

In Lwow the tramways are closely connected with the city's electric light and power supply, both being controlled by the same municipal department, and together forming the "Lwow electricity works," which are a credit to those responsible for their management, and a profitable source of income to the town. In 1908 the tramways were greatly extended, and a new supply station erected, the two schemes together costing £646,000.

The relative number of passengers carried daily by the Lwow tramways was greater than in any other Polish town, representing one-third of the city's population.

Lodz—the "Polish Manchester," as it is frequently called—was one of the first of the Polish cities to adopt electric traction. That the tramways were a real boon to the many workers of this busy and straggling town—which, with its 508,500 inhabitants (in 1912) covered an area of 12½ square miles—was proved by the fact that although passengers were not numerous at other times of day, the cars were always crowded during the hours of from 7 to 9 a.m. and 6 to 8 p.m., as well as at midday. Warsaw's new system of electric tramways were constructed and worked in accordance with an agreement entered into in 1905 between the municipality and a small group of financiers, which provided that the latter were to carry out the scheme at the expense and under the supervision of the former. The total cost of construction and equipment, including generating station, repair workshops, and sheds, was estimated at £673,360 (6,380,000 roubles), which amount was not exceeded. The group was to pay the town interest at the rate of 5½ per cent. per annum on this sum, besides a guaranteed minimum annual income of £42,428. In addition the town was to receive half the net profits realised, after payment of all expenses, including the above sums, and a sum of £63,325, representing the salaries of five members of the group, forming the board of directors. The group has the sole right of exploitation, for a period of fifteen years, expiring in 1922, and without its consent the municipality may not permit the introduction of any other means of communication in the streets of Warsaw.

The construction of the new system was begun in 1906, and the service made available to the public in the spring of 1908, a delay of a few months having been caused by the unsettled state of the country. The total length of line, consisting of double track throughout, is 31 miles, and the rolling stock consists of 200 trolley cars and 60 trailers, of the latest design and perfect finish. Both kinds have seating accommodation for 24 inside, and standing room for 16 on the platforms.

It is to be foreseen that Warsaw's tramway system will be greatly extended shortly after peace is restored. The inclusion in the city boundary of extensive suburban areas—whose inhabitants in 1909 numbered over 150,000—had been under consideration for some time previous to the war, and was carried out in 1916. The extension, as well as the proposed linking up of numerous outlying districts, will undoubtedly afford great opportunities to enterprising contractors, and it is to be hoped that at least some of the contracts will be secured by British firms.

Digitized by Google

THE
Tramway and Railway World

FOUNDED IN 1892 AND PUBLISHED BY
THE TRAMWAY AND RAILWAY WORLD PUBLISHING COMPANY, LIMITED,
AMBERLEY HOUSE, NORFOLK STREET, LONDON, W.C.2

SUBSCRIPTION RATES

THE TRAMWAY AND RAILWAY WORLD can be obtained, post free, at the following rates:

FOR THE UNITED KINGDOM Twenty-five Shillings per annum.
FOR ALL PLACES ABROAD—Thirty Shillings per annum.
Single Copies—One Shilling (Postage, 2 pence—Abroad, 5 pence).

THE ANNUAL SUBSCRIPTION INCLUDES 64 ISSUES, OF WHICH 12 ARE ILLUSTRATED NUMBERS.

In consequence of the restrictions on the use of paper, readers will be unable to obtain copies of THE TRAMWAY AND RAILWAY WORLD unless a definite order be given in advance. Those who order copies in this way from newsagents and experience any difficulty in obtaining them should communicate with us.

THE EDITORIAL AND PUBLISHING OFFICES OF
THE TRAMWAY AND RAILWAY WORLD
ARE AT AMBERLEY HOUSE, NORFOLK STREET,
LONDON, W.C.2

Telephone No.: GERRARD *2948.*
Telegraphic Address: "TRAMIGRO, ESTRAND, LONDON."

LONDON, SEPTEMBER 12, 1918.

London Traffic Reform.

It is to be hoped that the public passenger transport interests of the metropolis will take advantage of the failure of the Home Office management of the police force to represent again to the Government that the time is opportune for setting up a Traffic Board for Greater London. The change in the person of the Chief Commissioner of the force is not likely to bring any amelioration of the grievances and hindrances to which the traffic authorities have too long submitted. The new commissioner is a military officer unacquainted with the imperative needs of the capital for the development of its transport system and the problems that sooner or later must be solved. Moreover, the new chief has distinguished himself as an autocrat who has defied both the Public Accounts Committee and the officials who were appointed to effect reforms in the staffing of the War Office. Hitherto the traffic authorities have been content to pass resolutions pressing upon successive Governments the need for carrying into effect the recommendations of the Royal Commission on London Traffic, but there are a number of circumstances that now combine to call for stronger action than petitions that meet only with acknowledgment. These circumstances concern not the advancement of sectional interests but the welfare of the metropolis and the surrounding districts. In the first place, the London County Council are faced with the necessity of spending a sum estimated at over two millions sterling for housing accommodation. The great bulk of that work must of necessity be carried out beyond the boundaries of the county, and with that object in mind the Council are about to hold conferences with the authorities of contiguous districts. The erection of great areas of new houses must entail road widenings and the construction of new roads. Most important of all, there will have to be great extensions of the tramways of various authorities, and possibly in some instances electric railway construction may be preferable. There may be cases, too, in which initial needs may be met by motor omnibuses. All these questions imperatively call for the formation of a co-ordinating and controlling authority in the form of a Traffic Board. Another great desideratum is that London should be freed from the blighting hand of one or two permanent officials at the Home Office. Those persons were no doubt just as much responsible as the late Chief Commissioner for the persistent ignoring of traffic needs, as exemplified by the opposition to trailer cars against the advice of the Board of Trade and the Home Office opposition to almost every Bill for tramway extension. The latest example of this unreasoning opposition is shown in the long drawn out objection of the police to discharge what is one of their primary functions, namely, the protection of the travelling public by the institution of queues at omnibus stopping points. In partially abandoning this attitude just before his retirement, the late commissioner pleaded that the formation of queues must entail extra expense upon the ratepayers for additions to the strength of the force. He failed to see that the ratepayers are not opposed to such an expenditure, for the strongest advocates of queues have been the metropolitan borough councils, which have been pressing the subject upon his attention for a year past. Equally weak was the contention of the late commissioner that queues will constitute a

Digitized by Google

danger to pedestrians using the pavements. This argument becomes absurd in relation to such places as Trafalgar Square. The success of an experiment by the omnibus company at Hammersmith nearly two years ago shows that the innovation can be adopted at the Square with the greatest ease. The present situation presents an opportunity that should not be lost for pressing on the movement for traffic reform for which London has waited so long. In this era of reconstruction the prospect is more favourable than at any previous period. In the present President of the Board of Trade the Prime Minister has an expert and trusted adviser. To delay now may entail years of waiting.

Women's Wages. A serious situation has been created by the award of the Committee on Production published on August 30, which is given in full elsewhere in this issue. The award conceded the claim that the total remuneration, including war bonuses, paid to tramway and omnibus women employees must be the same as that paid to men, if the women are doing what is called the same work. As is well known, the women conductors who do "the same work" as the men are really much more costly to employ, because of the larger percentage of absenteeism which necessitates the engagement of many spare hands, and because new women have continually to be trained to replace those who abandon the work. The award of the Committee on Production will greatly add to the financial difficulties of tramway and omnibus undertakings, and it is problematical whether anything like adequate relief will be obtained under the Statutory Undertakings (Temporary Increase of Charges) Act of this year. Certainly there will be much delay in securing the approval of the Board of Trade to changes which the tramway authorities may regard as necessary. Serious as the increased cost entailed by the award will be, the outlook for the future is even more threatening. It was only on July 9 last that the Committee, after careful consideration of the case presented by both the employers and the employees, made an award refusing to grant to the women an additional advance of 5s. a week which they granted to the men. Such awards are supposed to stand for four months before there can be any appeal or re-hearing, but the London omnibus women conductors struck work in the middle of August. They were supported by the men's trades unions in defiance of the advice of their leaders; and the intimidated Government at once called on the Committee on Production to reconsider the matter. The result was a foregone conclusion; the women were given the desired advance with the least possible delay. The Committee on Production, to justify the reversal of their previous decision, pointed out that up to the time when that award was given a 12½ per cent. bonus had been confined throughout to men. Since July 9, however, the Minister of Munitions had granted an advance of 5s. to women munition workers, and for this reason the Committee thought it necessary to give it also to the women tramway and omnibus workers, without reference apparently to the justice of their claim. The Committee, however, evidently feel considerable anxiety as to the future, and they recommend that the whole question of women's wages should be made the subject of a special inquiry. The Government, prepared beforehand for this proposal, simultaneously announced the appointment of a Committee to inquire into the whole subject. All industrial occupations in which women are employed are apparently to be brought under review. What the future holds no one can tell, but the prospect seems to be one of indefinite increases in wages, and consequently of indefinite increases in the cost of materials and in the cost of living. Unless the Minister of Reconstruction can discover some remedy which is not now apparent, something like industrial anarchy may result when wages begin to come down after the war. The object of the men's trade unions in supporting the women's demands for equal pay is tolerably clear. They desire to create such a condition as will prevent the women from continuing to be employed after the war. Men will then be available, and if they can be had at the same wages as women they will in many occupations be preferred by employers. It is possible that the women will find that they have been short-sighted in their insistence upon equal pay for what is not in fact equally valuable service.

Digitized by Google

Traffic Control at Street Junctions.

As one outcome of two days' absence at the majority of busy London junctions of police supervision of traffic, the question may be asked whether it is advisable to hold up periodically the various lines of traffic in order to relieve each stream in turn. At junctions traversed by tramways the County Council tramways department had placed inspectors with red flags to facilitate the car traffic, but their services were rarely requisitioned. Drivers of all vehicles continued on their way while the road ahead was clear, and traffic from a cross direction remained stationary until an opening presented itself. It is generally admitted that under these circumstances the junctions were less congested than when point policemen were on duty. Pedestrians suffered no inconvenience. They found their way across the roads at the head of a halted line, and, more often than not, through the intervals between vehicles in slow motion, while at the Elephant and the Mansion House, where subways exist, foot passengers had no need to concern themselves with above-ground conditions. The absence of police served to demonstrate the hollowness of all that has been said concerning the magic sweep of the arm of the point duty constable by writers who apparently have never seen traffic controlled at the great provincial centres. As to police control at junctions in general, the question may be asked whether the time has not arrived for the trial of a system of signal posts, such as are to be seen in American cities, operated from an elevated cabin. That method would do away with the risk to life and limb, involving such a fatality as that which occurred to a constable at Ludgate Circus a few years since. In view of the experience at the junctions during the absence of the police it would also be worth while for experiments to be made under official direction for the purpose of definitely ascertaining which method—control or non-control—leads to least congestion. Heads of the police force ought to be the first to approve of a trial. All inquiries go to show that where there was no artificial hold-up of traffic there were either none, or at least fewer, blocks. As it is perhaps hopeless to expect Scotland Yard to take an unbiassed attitude on this matter, the tramways department of the County Council might invite their inspectors to report upon their two days' experience, with a view to elucidating the aforementioned point. No doubt in the provinces it would be an easy matter for managers to arrange with the police for the carrying out of experiments.

Coal Economy.

Elsewhere in this issue reference is made to the final report of the Coal Conservation Committee of the Ministry of Reconstruction, which has presented the reports of various sub-committees. The first of these was the report of the Electric Power Supply Sub-Committee, a long abstract of which was given in our issue of January last. Among the other reports which are dealt with in our present issue is that of the Mining Sub-Committee, one of the most interesting features of which is a proposal for the creation of a Ministry of Mines and Minerals. In spite of the number of new Ministries that have been formed since the war began, there seems to be a good case for this proposal. The work now done by various departments and committees could be brought under one control, and a great deal of work now not done at all could be carried out to secure economy and efficiency, both in the mining and the consumption of coal. It is interesting to observe in connection with the report of the Carbonisation Sub-Committee that that body is of opinion that the introduction of carbonisation and gasification processes for the preparation of coal as a preliminary for its use for steam raising is still an open question. The Sub-Committee also, while agreeing that the use of large turbo-generator units is essential to economy in large power-stations, consider that there is a definite field for the use of gas engines in special circumstances, and in cases where the most suitable units are of relatively small size, say only 3,000 or 4,000 KW. This is particularly interesting in view of the history of the employment of gas engines in power stations. The Sub-Committee anticipate important developments in the design and use of these engines. A detailed study of the various reports should be made by all interested in coal, whether as producers or consumers.

Digitized by Google

TRAMWAY AND OMNIBUS WORKERS' WAGES.

A STRIKE FOLLOWED BY A NEW AWARD BY THE COMMITTEE ON PRODUCTION TO WOMEN WORKERS.

The women employees in the tramway and motor omnibus industry have been completely successful in their agitation to obtain wages equal to those paid to the men. After the award by the Committee on Production on July 11, which was given in full in our issue of August 15, there was widespread dissatisfaction with the refusal of the Committee to grant to the women the additional bonus of five shillings per week which was given to the men. An agitation was immediately commenced, and as a consequence an extensive strike broke out suddenly in the London area on Saturday, August 17, when the tramway service was practically stopped. It was estimated that within two days 10,000 employees ceased work and 3,000 vehicles, including those of the company-owned undertakings, were taken off the streets. The strike also extended to several towns in the provinces. This action was against the wishes of the officials of the trades unions, who were, however, powerless to influence the employees to continue their duties. Sir George Askwith, Chief Industrial Commissioner, promptly intervened, but the strike continued until August 22, when the employees decided by a large majority to return to work pending the consideration by the Committee on Production of the question of whether or not the women employees should be placed on an equality with the men employees in the matter of wages. On August 23 there was a general resumption of work in the metropolitan area and in the provinces. The Committee on Production, after meeting representatives of both parties, issued on August 29 their award, which was as follows :—

TEXT OF THE AWARD.

1. The parties to this reference are (1) the Municipal Tramways Association, the Tramways and Light Railways Association, the London United Tramways (Limited), the Metropolitan Electric Tramways (Limited), the South Metropolitan Tramways (Limited), the London General Omnibus Company (Limited), the London Omnibus Section of Messrs. Thomas Tilling (Limited), the National Steam Car Company (Limited), the Croydon Corporation, and the British Automobile Traction Company (Limited) (London Branch), and (2) the National Transport Workers' Federation.

2. The claim submitted was as follows :—

(*a*) Interpretation of Committee on Production awards, viz., whether under Clause 14 of the award of July 9, 1918, the Committee intended to nullify any agreements or undertakings, and in particular any such undertaking as is alluded to in Clause 4 of the award of March 8, 1918.

(*b*) That equal total payments be made to women as to men for equal work in the tramway and omnibus undertakings, parties to the awards of March 8 and July 9, 1918.

(*c*) That any present change of payment should date from the beginning of the first full pay day following July 9, 1918.

(*d*) That any future changes of payments should take place conjointly with those of the men.

In the case of the Croydon Corporation the application submitted included a claim for the extension to the employees of that authority of the awards of March 8 and July 9, 1918, for tramway and motor omnibus employees.

3. The matter was referred by the Ministry of Labour to the Committee on Production for settlement, and representatives of the parties were heard on August 26 and 29, 1918.

4. The award of March 8, referred to in the claim, dealt with an application for an advance of wages for male and female employees engaged in connection with tramways and motor omnibus undertakings. The award provided for certain increases to men and women aged eighteen years and over, and to boys, youths, and girls under eighteen years, in those cases where the terms of employment include an undertaking that women should be paid the same rates as the grades of men whose places they had filled, the Committee gave the same advance as to men, that is, a total of 20s. a week over pre-war rates. In the case of women not covered by such an undertaking the Committee gave an increase of 4s. a week, subject to a maximum of 20s.

5. The claim dealt with in the award of July 9 was for an increase of 12½ per cent. upon the present total earnings, or for a standard increase equivalent thereto, and for such a revision of the award of March 8, 1918, as would provide for equal payment for women as for men, both as regards war wages and basic rates. By their award of July 9 the Committee increased the war wage advance already paid to men aged twenty-one years and over from 20s. to 25s. a week, such advance being intended to cover any claim with respect to the bonus of 12½ per cent. The Committee found that the claim with respect to the bonus of 12½ per cent. in the case of women had not been established, and they came to a similar decision with regard to the application for the revision of the award of March 8.

6. Subsequently to the issue of the award the employees of the London General Omnibus Company and certain other passenger transport companies in the London area struck work, expressing dissatisfaction with the terms of the award, and pressing for consideration of the question of the relation of the wages of men and women. Negotiations ensued between the employees and the Ministry of Labour, as the result of which the employees resumed work, and the matter was referred to the Committee on Production under the headings set forth in Clause 2 of this award. The Committee think it right to point out that the circumstances which have led up to the submission of the present claim and its reference to them have necessarily influenced them in considering and dealing with the matter.

THE CLAIM FOR EQUAL PAY.

7. In dealing with the claim that equal total payments be made to women as to men for equal work, it is necessary to distinguish between the elements of which these total payments are composed. The payments made to the men contain the following three elements, viz. :—(1) The base rate of wage ; (2) the additions made thereto since the outbreak of war by way of war bonus or war wage advance, with a view to meeting the increased cost of living ; (3) the addition of 5s. per week granted under the award of July 9, as a war wage advance to include and to be deemed to be in full settlement of any claim with respect to the bonus of 12½ per cent.

8. In considering the last-mentioned 5s. per week regard must be had to the origin and purpose of the 12½ per cent. bonus and to the circumstances which have led to its various extensions. The original grant of the bonus by the Minister of Munitions under the powers conferred upon him by the Munitions of War Act, 1917, and all subsequent extensions of the bonus by orders of the Minister, or by agreements or awards, have been confined to male workers twenty-one years and over. Under these circumstances the Committee, in adjudicating on the claim of women workers on tramways and motor omnibuses by their award of July 9, 1918, did not feel justified in treating the bonus as one which could properly be extended to women or be made the subject of a compensatory advance of wages.

9. Since the issue of the award of July 9, however, the Minister of Munitions, in pursuance of his statutory powers, has granted to female workers employed on or in connection with munitions work an advance of 5s. per week, which may be assumed to contain an element of compensation for their exclusion from the 12½ per cent. bonus. The policy indicated by that grant, and by the reference to the Committee by the Ministry of Labour of the renewed claim on behalf of the women concerned in this case, for some advance in lieu of the bonus, and the circumstances mentioned in Clause 6 of this award, makes it necessary for the Committee to consider the position as it at present exists, and they have arrived at the conclusion that the women concerned should have the advance granted by Clause 10 of this award, such advance to be deemed to include and to be in full satisfaction of any claim in respect of the 12½ per cent. bonus.

10. With regard to item (*b*) of the claim so far as it relates to an application for an increase of wages, the decision of the Committee is as follows :—

(1) To those grades of women aged eighteen and over, whose terms of employment include an undertaking that they shall be paid the same rates as the grades of men whose places they have filled, there shall be paid such advance as shall give 25s. per week over the pre-war rates of the grades concerned, payment to be made on the basis of a week of six days or six shifts.

(2) In the case of women aged eighteen and over, not covered by Clause 10 (1), the advances now being paid shall be increased by 5s. a week, subject to a maximum of 25s. a week over the pre-war rates of the grades concerned, payment to be made on the basis of a week of six days or six shifts.

(3) The increases hereby awarded shall take effect as from the beginning of the first full pay following July 9, 1918. They are to be regarded as war wages and recognised as due to and dependent on the existence of the abnormal conditions now prevailing in consequence of the war.

11. As regards item (*a*) of the claim, the award of July 9, 1918, does not nullify any agreements or undertakings in existence between any of the parties to the award, relating to the payment of women.

12. As regards the items mentioned in Clause 7 of this award and numbered (1) and (2), the claim submitted covering these items is put forward in such a form as to involve the determination of a general principle applicable, if adopted and established, not only to women employed on tramways and motor omnibuses, but to women employed in many other industries. Such a principle can only be decided on a national basis after full, comprehensive, and detailed investigation, with due regard to the far-reaching financial and economic considerations involved, and after hearing all interests that would be affected, including those women (if any) engaged in other industries, whose interests might be considered by them to be affected. The Committee therefore recommend that the whole question of women's wages and advances should be made the subject of a special inquiry, in which women can take part, and at which all the facts and circumstances which must be taken into account

Digitized by Google

before any general guiding principle can be safely or properly formulated, may be fully investigated and considered.

13. In regard to item (*d*) of the claim, the Committee approve of the principle that when general changes of wages are under consideration the wages of women, as well as men, should be considered, and they recommend that the parties should formulate an agreement, providing for a regular procedure for the periodical consideration and review of wages in the industry concerned.

14. As regards the claim submitted in the case of the Croydon Corporation for the extension to that authority of the awards of March 8 and July 9, the Committee suggest that the parties should meet with a view to arriving at a settlement between themselves on the matter. If any points then remain on which the parties are unable to agree, it shall be open to either side to ask the Committee to give a decision thereon, and, if necessary, to arrange for a further hearing to afford the parties an opportunity of stating their case before the Committee.

GEORGE S. GIBB. F. B. BUTTON.
WILLIAM W. MACKENZIE. JOHN BARKER.
JOHN M. DENNY.

A COMMITTEE ON WOMEN'S AND MEN'S WAGES.

On August 29 also the following official announcement was issued :—

The Government have decided to appoint a Committee "to investigate and report as to the relations which should be maintained between the wages of women and men, having regard to the interests of both, as well as to the value of their work. The recommendations should have in view the necessity of output during the war, and the progress and well-being of industry in the future."

The Committee will consist of Mr. Justice Atkin (Chairman), Dr. Janet Campbell, Sir Lynden Macassey, K.C., Sir W. W. Mackenzie, K.C., and Mrs. Sidney Webb. Lieutenant-Colonel Sir Matthew Nathan (secretary to the Ministry of Pensions) has been appointed as secretary to the committee.

Communications on matters concerning the committee should be addressed (till further notice) to the Secretary, No. 2, Whitehall Gardens, S.W.1.

THE CASE FOR THE EMPLOYERS.

The following statement briefly summarises the case of the employers against the concession to women of the additional bonus, and explains their view of the claim that women employees should be paid the same wages as men :—

From time to time since the outbreak of war applications for increased remuneration have been made by tramway and omnibus employees, and an agreement was come to in February of this year between the National Transport Workers' Federation and organisations representative of the employers, that such applications would be dealt with on a national basis, and, failing agreement, would be submitted to the arbitration of the Committee on Production, whose findings would be binding on both sides, and would not be subject to review under periods of four months.

In March last an award was given, involving the employers in additional payments of hundreds of thousands of pounds per annum. In July the Transport Workers' Federation submitted a new claim for (1) payment of a bonus of 12½ per cent. on total earnings to men and to women, and (2) equal payments to women as to men both as regards basic rates and war wages.

In accordance with agreement, this claim was submitted to the Committee on Production, who, after a careful hearing of the statements of both sides, made an award to the following effect :—(1) That an additional war wage of 5s. per week (making a total war wage advance of 25s. per week) be paid to able-bodied men in full settlement of any claim with respect to the 12½ per cent. ; (2) that the claim for the payment of 12½ per cent. to women had not been established ; (3) as regards the claim for the payment of the same basic rates and war bonuses for the women as for the men, the award was as follows :—" It was stated on behalf of the employers at the hearing that they accepted the principle that in cases in which women are doing the same work as men, and doing it as efficiently, and provided their employment does not involve increased expenditure compared with the employment of men, they should be paid the same wages as men.

ADDITIONAL COST OF WOMEN EMPLOYEES.

" They showed, however, that in the case of tramway and motor omnibus undertakings a large number of women employees stay only a comparatively short time, and their attendance is less regular than that of men, necessitating the keeping of a large spare staff, which adds to the cost of employing women. The decision of the Committee with reference to the application that the award of March 8, 1918, shall be revised so as to provide for equal payment to women and men both as regards war wages and basic rates is that the claim has not been established."

In the whole of the undertakings in London where the present strike originated the basic rate of wages to women is the same as that paid to men. The decision of the Committee on Production in withholding from women any payment in respect of an application for 12½ per cent. has followed the practice of all Government departments in connection with the matter. Throughout the country there has not been, in any industry, any award for the payment of 12½ per cent. or any sum in lieu thereof to women.

The question raised is therefore a national one of first importance, as if the present application is carried into effect in regard to tramway and omnibus women, it would, logically, raise for similar consideration the whole question of the remuneration of women engaged in munitions and all other forms of industry. The strike in London, without any notice to the employers or to the public, and in direct contravention of the instructions of the National Transport Workers' Federation, the agreed negotiating body, is against an award of the official Committee on Production, set up by the Government to deal with wages disputes. If the decisions of such Committee are to bind only one of the parties to a dispute, then the whole of the machinery of the Munitions of War Acts, under which such differences are to be dealt with and awards made, is rendered useless.

Signed on behalf of the
London General Omnibus Company, Limited H. E. BLAIN.
Thomas Tilling, Limited ... ... W. WOLSEY, Jun.
Tramways and Light Railways Association ... A. DE TURCKHEIM.
Municipal Tramways Conference ... ... WILLIAM CLOUGH.

STRIKE ON THE TUBE RAILWAYS.

The services of the tube railways in London were considerably interrupted from August 24 to August 27, owing to a strike in which a large number of employees participated. The strike, which was undertaken, generally speaking, without any preliminary backing on the part of the trade unions concerned, arose out of a question of wages, owing to the dissatisfaction felt among the women employees at having received a bonus of only 12s. 6d., as against 25s. awarded to the men employees, and to the wish to assert the principle of equal pay for the same class of work, whether done by men or women. The train service was kept up very well, this result being facilitated by the closing of several of the less important stations on the Bakerloo, Piccadilly, Hampstead, and City and South London tubes. On August 26 the strikers decided to resume work on August 28, but many anticipated the decision by returning to their posts on August 27. It was understood that the strike was abandoned with a view to subsequent consideration of the claim for equal pay. This claim is presumably one of the subjects which is before the Committee which the Government have appointed to inquire and report in regard to men's and women's wages.

A Decimal Coinage Commission.—A Commission has been appointed to " consider and report whether it is advisable to make any changes in the denominations of the currency and money account of the United Kingdom with a view to placing them on a decimal basis, and whether, if an alteration of the present system is recommended, it is desirable to adopt, with or without modification, the proposals embodied in the Bill recently introduced in the House of Lords by Lord Southwark, or some other scheme, and in the latter alternative to make specific recommendations for consideration by Parliament." The Commission is to consist of Lord Emmott, Lord Southwark, Lord Faber, Lord Ashton of Hyde, Lord Leverhulme, Sir Richard Vassar-Smith, Sir Joseph Larmor, Sir George C. Marks, Sir Alfred Watson, Mr. J. W. Causton, Mr. S. A. Smith, Mr. C. Godfrey, Mr. James Bell, Mr. Joseph Burn, Mr. Harold Cox, Mr. G. Hayhurst, Mr. Theo. McKenna, Mr. G. Marks, Mr. J. F. Mason, Mr. Albert Smith, Mr. G. M. Smith, Mr. G. C. Vye. The Commission is empowered to call witnesses and to examine books, documents, registers, and records. Pending the appointment of a secretary, which will be announced later, communications may be addressed to " The Royal Commission on Decimal Coinage," Treasury Chambers, London, S.W.1

" Safety First " in Darkened Streets.—With a view to obviating a probable increase of accidents as a result of the further restricted street lighting, the London " Safety First " Council offers the following advice to pedestrians in the streets after dark :—(1) Look to the right before crossing the road ; (2) cross the road from a street lamp ; (3) make full use of street refuges ; (4) always face approaching traffic. The Council points out that if all pedestrians kept to the left, instead of to the right, of the footpath on which they are walking, people would not step off the kerb into the road with their backs to oncoming vehicles, one of the chief causes of accident.

Fund for Loyal Croydon Employees.—A fund inaugurated by a local resident for the purpose of making a recognition of the loyalty of those Croydon Corporation tramways employees, about fifty, who remained at work during the recent strike, has received substantial support, and a total of about £70 has been subscribed. It is proposed to close the fund on September 14, and the subscribers will be consulted as to the disposal of the money contributed. The treasurer is Mr. T. G. Dyson, 19, George Street, Croydon.

Digitized by Google

TRANSPORT IN RELATION TO AGRICULTURAL DEVELOPMENT.

In the recently-issued report of the Sub-Committee on Agricultural Policy (appointed by the Reconstruction Committee) considerable attention is devoted to the question of transport, especially as regards light railways and road motor vehicles. The report states, among other things :—

The general question divides itself under two heads :—(*a*) Facilities for, (*b*) cost of, transport. Dealing first with (*a*) facilities for transport, this again may conveniently be sub-divided into those where the distances to be covered are respectively long and short, ordinary railways and canals coming within the former and light railways and motor services within the latter category. It is not possible to define with exact precision the different spheres of activity of light railways and of motor services. In one district, where the farm buildings are accessible by good roads to motor vehicles, a motor service may best meet the need. In another district, where the farm buildings generally lie off the made roads, and are accessible only by unmade and often steep tracks, a light railway may be preferable.

Light Railway Movements. Comparative Failure.

It is in connection with short distance transport that we look for the greatest improvement. These facilities should be provided as feeders for ordinary railways with the object of expediting and cheapening delivery to distant markets. Whether development will best proceed in the direction of an extension of the light railway systems or by the organisation of motor transport services, or by a combination of both, remains to be seen.

In view of the large areas of land in good agricultural districts which are still four or five miles from the nearest railway, it is disappointing that the light railway movement has not proceeded with greater rapidity. Doubtless this has been due in part to the comparatively close network of ordinary railways which exist and in part to the initial cost of promoting light railway schemes, but mainly, perhaps, to the difficulty in finding capital for an object from which the direct financial return is uncertain. This latter view is borne out by figures showing the number of schemes which have come under the consideration of the Light Railway Commissioners. In 52 cases Class A lines (i.e., lines on lands acquired, mostly steam motive power and such as would usually be employed for the carriage of agricultural produce), covering in all 532⅝ths miles have been constructed ; in 137 they have been authorised and the projects are still in being, though construction has not been commenced ; in 100 they have been approved, but not yet authorised ; while in 662 they have been authorised, but have since been abandoned owing to the necessary capital not having been subscribed.

The promotion of schemes received an impetus through the passing of the Light Railways Act, 1896. Between December, 1896, and the end of 1899, 122 applications in respect of railways Class A were received, involving 1,625 miles of line, estimated to cost nearly nine and a half millions sterling. Since then the number has dwindled appreciably, the total applications between the date last mentioned and the middle of 1917 being only an additional 135, for 1,150 miles of line at an estimated cost of about ten millions sterling. In view of these figures, the mileage of Class A lines constructed (532⅝ths miles) cannot be looked upon as other than disappointing, especially in view of the large amount of good agricultural land still without railway facilities. The comparative failure of the light railway movement has been attributed to the large cost of the Class A lines, which we understand averages about £7,000 per mile, and the difficulties experienced in obtaining capital. How this should be remedied would seem to be outside the scope of our reference, but we are of opinion that the matter is one deserving of careful inquiry by a competent authority.

Development of Motor Traction.

The development of the mechanical road car would seem to have opened out new possibilities. Such a form of transport has the advantage that it is not restricted to a particular route, but can be organised to touch any points where needed, and, by calling at individual farms, may enable horses and men, which would otherwise be engaged in the delivery or collection of goods, to be more profitably employed in the cultivation of the land or other farm work.

As an example of the existing uneconomic method of delivery, an instance has been quoted of half a dozen farmers sending half a dozen carts twice a day along the same road to deliver a few churns of milk at a railway station, each as a rule bringing back merely an empty churn or two.

The Agricultural Organisation Society have long recognised the need for improvement in rural transport, if producers in country districts are to be linked up more closely with consumers in the towns. In 1912 they placed before the Development Commissioners a number of instances in which motor tranport services were desirable in the interests of agriculture, with the object of ascertaining the extent to which assistance from the Development Fund might be anticipated. At the request of the Commissioners the society set themselves to obtain further particulars with regard to the cost of running, the best system of collection and distribution, the effect of local bye-laws, and other matters, more detailed information upon all of which seemed necessary before a definite policy could be approved. As a result a considerable amount of information was collected, and motor services were recommended in a number of districts.

The matter, however, was allowed to stand over, as the Development Commission had in the meantime appointed an expert to report on the question of motor and light railway transport. It was subsequently decided that consideration of the question in the abstract, with a view to a pronouncement applicable to all cases that might arise, would necessarily be accompanied by so many qualifications as to be valueless. It was therefore decided to take a number of concrete cases and to examine in some detail the conditions affecting the problem in each.

Only one of these inquiries has been completed, that by Mr. G. A. Burls, M.Inst.C.E., upon "The Relative Costs and Advantages as between a Light Railway and a Road Motor Service from Headcorn (Kent) to Robertsbridge (East Sussex)." As a result of an exhaustive inquiry this gentlemen arrived at the conclusion "that the existing Kent and East Sussex Light Railway deals with the goods and passenger traffic of the district at roundly 60 per cent. of the cost that would be incurred by a road motor vehicle undertaking doing the same work, though it is probable that the convenience both to the travelling and trading members of the community would on the whole be greater with the more expensive system."

Motors Stimulate Need for Railways.

Mr. Burls, in his report, pointed out that the farm buildings in the district under consideration were not as a rule accessible to motor vehicles, that the tracks to the farm buildings being usually unmade, often steeply inclined and generally in bad condition, it would be impossible to take heavy motors over them. In such circumstances one of the great advantages of a motor service, that of relieving farmers from having to employ horses and carts in delivering produce to the carrying undertaking, would to a great extent be lost ; but proper accommodation roads could be made, and in any case such conditions would not necessarily preclude individual farmers from co-operating to provide lighter motors for collecting produce from farms and delivering it to the undertaking.

Cases may doubtless occur where the amount of merchandise to be carried would not justify the cost of constructing a light railway, although sufficient to warrant the establishment of a motor service ; but as a rule it would seem likely that when the markets to which the produce is dispatched are distant, motor services would best act in combination with ordinary or light railways rather than in substitution for them. In this connection the following extract from the report of the Light Railway Commissioners for 1911 is of interest :—

"With regard to the great development in recent years of motor traction, it is of interest to note that in our experience, confirmed by the two cases of proposed light railways which we have most recently had under consideration, the establishment of a service of motors (in each case combined with the organised co-operation of agricultural and other local industries) had tended to stimulate the desire, and to emphasise the need, for better railway facilities, rather than (as it is sometimes supposed would be the case) to take their place. In these cases evidence was brought to show the considerable extent of saving to the road authorities in the annual cost of maintenance, which would follow from a transference to a railway of the traffic carried on roads ; this point was also in accord with our experience as bearing on the economy of transport by railway.

"In making these observations, we appreciate that, in districts where it is not practicable to construct a railway, and where the traffic is not sufficient to support one, a motor service (especially when combined with some "co-operative" system) may be of much use, and in many cases would develop traffic to a point at which railway facilities would become requisite and feasible."

It has been stated that the cost of constructing light railways in this country, which averages about £7,000 per mile, is too heavy and has militated against their more general adoption, and that this might be remedied were lighter railways of narrower gauge laid down in place of the standard gauge now usually authorised. If, however, the view is accepted that motors should as a rule act at carriers from farms to light railways, which in their turn should act as feeders to ordinary railways, there is much to be said in favour of a uniform gauge in order that transhipment may be avoided, and the same rolling stock be used throughout.

Questions of Road Wear and Bridges.

Such a combination would have the further advantage that the roads would be relieved from heavier forms of transport. We are informed by the Agricultural Organisation Society that local authorities have already shown a disposition to place restriction on the use of motor vehicles owing to the heavy wear and tear of the roads, and that in the case of the Agricultural Co-operative Trading Society at Brandsby they were only restrained from claiming against the society by a relaxation of the Board of Trade restrictions brought about by the intervention of the A.O.S.; further, that a scheme for introducing a system of motor transport in Anglesey was brought

Digitized by Google

to a standstill by a report of the county surveyor that the roads and bridges were incapable of bearing the strain. Some adjustment will have to be arrived at by the general improvement of the roads and by the strengthening of the bridges and culverts, but the cost in this respect will be lessened if the systems of transport adopted permit the use of lighter forms of motors calculated to cause the minimum of wear and tear. In comparing the cost of running a motor service with that of a light railway the additional expense thrown upon local authorities in the necessary upkeep of roads is a material factor.

Army Motors After the War.

It has been pointed out that after the war large numbers of motors no longer needed by the army will be placed upon the market, and that many of these will be suitable, when repaired and adapted, for various classes of co-operative societies; thus large lorries capable of carrying three tons would be suitable for trading societies and milk depots covering a large area where no railway facilities exist; small lorries, with a capacity of 1½ to 2 tons, might be usefully employed by smaller trading societies or depots and by the larger small-holding societies with a quantity of fruit or market garden produce for sale; while ambulances carrying ¼ to ½ ton might be adapted for lighter requirements, such as egg collecting, etc. We are of opinion that a scheme should at once be prepared by a competent authority to enable a proportion at least of these discarded motors to be made use of in the organisation of transport services and for other farm purposes.

The establishment of any co-operative system of motor transport must depend in the first instance upon a guarantee of adequate support from the farmers in the district which it is proposed to cover, and for whose benefit the service will be organised. This condition could best be fulfilled by the producers combining to form a Co-operative Trading Society, which would make them jointly and severally interested in the success of the undertaking.

Shortcomings of the Development Act.

Unfortunately such a method of procedure might give rise to difficulty were the Development Commissioners asked to co-operate in establishing the service, as the Development Act gives no authority to make grants or loans either to individuals or to companies or associations of persons trading for profit. The effect of this restriction is that sometimes the most direct way and simple method of giving effect to the purposes named in the Act is closed to the Commissioners. The extension of light railways, the Commissioners had stated, would in all probability be facilitated if loans could be made to existing companies, or to companies formed for the purpose of constructing and working lines, and possessing the right to receive for their shareholders a proportion of the net profits. The Commissioners, however, "think that the intentions of Parliament are not contravened if in these cases advances made by the authorities to individuals are either fair payments for experimental or other work, or are loans which are touched with no suspicion of charity."

Possibly some *modus vivendi* might be formulated in the direction indicated. County Councils already have power to promote agricultural co-operation, and it is probable that in some cases they would consider that the opening out of an isolated district, or the needs of a considerable section of the ratepayers, would justify them in helping to establish motor services.

A Detailed Inquiry Advocated.

In our opinion the need for better transport of every description in rural districts is urgent and immediate if agriculturists are to be placed in a position to take full advantages of the recommendations we have made for the development of their industry, and are to be enabled to devote themselves to the cultivation of their holdings in the fullest degree. But the matter is not one for the agriculturist alone; the industrial penetration of the countryside, which in some parts has been a feature of recent years, and which, with the improvement of telephonic and other means of communication and the growth of local rates in urban districts, seems likely to develop further in the future, makes it of wider national importance. The necessity for a prompt and ready delivery of milk, vegetables, and other agricultural produce in such districts, as well as for the transport of goods manufactured or required by such communities, adds to the importance of the subject, and we recommend that the whole question should be made the subject of detailed inquiry and report by a Special Sub-Committee of the Reconstruction Committee.

Turning now to cost of transport, we have already stated that Mr. Burls, in the report on a special case made by him to the Development Commissioners, found that the cost of a motor service would be about 40 per cent. in excess of similar facilities provided by a light railway; but we are of opinion that any attempt to make a general comparison between the cost of the two systems, or to arrive at any general estimate as to the cost of motor transport, would be misleading. In the first place a motor service would not usually be organised in substitution for similar facilities provided by a light railway, but as complementary thereto, and in the second, the cost would depend so largely on the class of service required and the description of motors used, that a generalisation as to the expenses would be of little value. At the same time we are of opinion that an inquiry would elicit valuable information.

COAL CONSERVATION.

The final report of the Coal Conservation Committee of the Ministry of Reconstruction was issued in the latter part of August. It states that at the first meeting of the Committee on July 16, 1916, they decided to appoint sub-committees to investigate and report on the several parts of the extensive subject. For the purpose of carrying out further investigations the Government have since established the Fuel Research Board. The Committee present reports (some of which have already been published) from the various sub-committees, which reports have been approved by the Committee. The first of them is the report on electric power supply, an abstract of which appeared in The Tramway and Railway World of January 17, 1918. Then came reports by the Geological Sub-committee and the Mining Sub-committee.

Proposed Ministry of Mines.

The latter report states that the Sub-committee have carefully considered the whole question of the establishment of a separate Department of Mines and Minerals. Under peace conditions the Government departments primarily concerned with mines and minerals are the Home Office, the Board of Trade, the Board of Education, the Woods, Forests and Land Revenues Department, the Admiralty, the Duchy of Lancaster, and the Duchy of Cornwall. Under war conditions the number and diversity of the functions of the State in the matter of mines and minerals show a great increase, and the report refers to the various committees on the subject which have been appointed.

Whether any of the powers of the Controller of Coal Mines will survive the war and the ensuing period of reconstruction, cannot now be determined, but, however this may be, the argument for unifying the functions of the State in respect of the coal mining industry will still demand consideration.

It is now proposed, the Sub-committee say, that all the functions vested in various Government Departments before the war in the matter of the coal mining industry should be transferred to and administered by a separate Ministry of Mines and Minerals presided over by a Minister with a seat in Parliament. Any developments of these functions should also be administered by this Ministry. The principal exception to the transfer we recommend is the Geological Survey, which we think should be transferred from the Board of Education to the Committee of the Privy Council for Scientific and Industrial Research. The powers of the Admiralty with regard to coal would no doubt remain unaffected.

The Minister of Mines and Minerals should, in the opinion of the Committee, be assisted by an Advisory Board consisting of representatives of the mining industry (including the workmen), together with men eminent in branches of science connected with the industry, and the claims of the principal classes of consumers to representation will require careful consideration.

Among other functions it is proposed that the new Ministry should undertake the following work:—

(*a*) *Mining Education.*—Having regard to the increasing complexity of mining operations, and the increasing need for scientific knowledge, it seems desirable that there should be co-operation between the Ministry of Mines and Minerals and the Board of Education with a view to making provision in the schools for some elementary training of a scientific nature. Moreover, it is recommended that the State should establish some system in the mining industry of scholarships and bursaries.

(*b*) *Research.*—The new Ministry and its Advisory Board would have important relations with the Department of Scientific and Industrial Research. It is understood that the plans of that department, so far as they are concerned with coal, fall into two main divisions, one of which is more closely connected with the sphere of work of a Ministry of Mines and Minerals than the other. On the one hand, the department is dealing with the whole question of fuel—its most effective preparation and most economical use—through the recently established Fuel Research Board. On the other hand, the department hopes to deal with problems connected with the mining of coal by delegating them to a Research Association established by the coal mining industry. It is contemplated that the Research Association will carry out investigations not only into the problems connected with coal mining and the more effective winning of coal, but also into problems affecting the general health and welfare of the workers. In the event of a new Ministry being set up, its Advisory Board would doubtless be in close touch with the Department of Scientific and Industrial Research, and would have ample opportunity of calling the attention of the department to problems, whether of production or of welfare, which seemed to require investigation.

(*c*) *Regulations as to Safety and Health.*—The new Ministry would naturally undertake the duty at present performed by the Home Office of framing regulations for safety and health at the mines.

(*d*) *Local Mining Problems.*—It would also be the duty of the new Ministry to set up and supervise the local or other machinery required for the purpose of dealing with the working of barriers, the drainage of water-logged areas, and various other mining problems which specially require local knowledge.

Digitized by Google

(e) *Mineral Resources of the Empire.*—The Committee are aware that it is proposed to set up an Imperial Mineral Resources Bureau for collecting information regarding the mineral resources and metal requirements of the Empire. They think it will be necessary to consider carefully the relations which ought to be established between such an Imperial Bureau, the Ministry of Mines and Minerals, the Committee of the Privy Council for Scientific and Industrial Research and other Government Departments in order to ensure full communication and interchange of information with the self-governing Dominions, India, and the Colonies, and to promote co-operation with them in the extension and development of knowledge with regard to the mineral resources and metal requirements of the Empire. At the same time they are convinced that the Minister of Mines and Minerals must retain in his own hands the full administrative control of his department and be directly responsible to Parliament.

In a final report the Sub-committee deal at length with loss and waste of coal and cost of production. Among the recommendations they make are the following :—

The Ministry of Mines and Minerals should have statutory power to take all necessary steps for the conservation of coal, and should be charged with the duty of providing, with the assistance of its Advisory Board, the necessary local or special machinery for preventing waste in working.

For the purpose of obtaining local information and advice, the proposed Ministry should appoint District Committees, consisting largely of practical men with mining experience of the district, and including representatives of both mineral lessors and lessees in the district.

The question of the consumption of coal at the collieries forms part of the larger question of economy in the use of coal for power, and should be dealt with accordingly.

The attention of colliery managers should be directed to the most efficient methods of saving coal in the process of cleaning.

A greater demand for small coal should be found, as, for example, by extending the market for patent fuel both for steam raising and for domestic purposes, and by developing the use of coal near the sources of supply in connection with power generation and carbonisation, and by the provision of adequate means for improving the quality of small coal by grading and washing.

An investigation should be made by the proposed Ministry into the methods of working seams of abnormal thickness.

More consideration should be given at many collieries working upon the bord and pillar system to making the size of the pillars left in the first working proportionate to the depth of the working, and to other circumstances of the mine.

The proposed Ministry of Mines and Minerals should have plans made showing the barriers in each colliery district, and be in a position to sanction the removal of all unnecessary barriers, and should have statutory authority to do so notwithstanding covenants in leases.

In cases where coal is drowned out more or less temporarily owing to the cost of pumping being too heavy, co-operation between collieries in the district for the concentration of pumping plant should be encouraged, but if this cannot be brought about the proposed Ministry should prepare a scheme, with the assistance of the District Committee, for draining the area by means of central pumping stations, and should have power to require the collieries in the district which are benefited by the scheme to contribute ratably to the cost.

The attention of colliery managers ought to be directed to cases of loss from top and bottom coal being left underground in mines under their management, and encouragement should be given to the colliery managers in a district to see for themselves the different methods practised in working the same seams in the district.

The proposed Ministry should have power to decide that any other order of working which is economically practicable shall be adopted when it is satisfied that the existing order of working is likely to result in the permanent loss of coal.

The Committee agree with a recommendation of the Royal Commission on Mining Royalties, 1893, and recommend that immediate steps should be taken to give effect to it. The recommendation is to the effect that when the surface belongs to one person and the subjacent minerals to another, and the surface owner having the right of support claims an injunction on the ground of threatened injury to his property, the Court ought to be empowered to exercise a discretion somewhat larger than that which it appears to possess at present. Where the Court may be of opinion that the interests of the surface owner may be adequately protected without enforcing his extreme rights, the Court should be authorised to permit the mine-owner to go on with his mining operations upon terms which would ensure to the surface owner ready information as to the progress of the workings, and ample security for the payment of compensation.

The Railway Clauses Acts, and other Acts containing similar provisions with regard to the terms upon which coal may be required to be left unworked for the support of the surface should be so amended so as to provide that the "prescribed distance" within which the provisions referred to apply shall be a distance from the railway (or other undertaking to which the Act applies), or any of the works connected therewith, equal to one-half the depth of the workings below the surface level of the land at the place.

The Committee agree with the conclusion of the Royal Commission on Mining Royalties (1893) regarding wayleaves, that owners of mineral property unreasonably debarred from obtaining access to the nearest or most convenient public railway, canal, or port on fair terms, or from obtaining underground easements on fair terms, ought not to be left without a remedy.

In cases where coal will be permanently lost unless it is worked by the lessee of the adjoining workings, and for any reason a legal title to work it cannot be got, the person who is able to work the coal should have the right to apply to the proposed Ministry for a certificate that the coal is in danger of being permanently lost, and when, after inquiry, such a certificate is granted, the Ministry should have power to settle the terms upon which the coal may be worked.

It is of great importance to stop the decline in the output of coal per head of the persons employed, and to increase this output if possible, and the Committee recommend that in so far as any restriction of the output is due to a feeling of insecurity on the part of the workmen and a belief that if they put forth a special effort to increase production they will suffer a reduction in their wages rates, a strong effort should be made to remove any justification which may exist for such a belief. It is only by increased production per head of the persons employed that our trade position can be maintained and improved conditions of employment can be secured, and this ought to be recognised by workmen as well as by employers.

Labour-saving appliances such as coal-cutting machinery and face conveyors should be more largely used than at present, and there is room for considerable improvement in underground haulages both as regards their extent and efficient application. In this case much depends upon the existence of a well-defined and systematic policy in the working of the mines.

The qualifications of mining officials of all grades ought to be improved, and in order to raise the standard the Committee recommend that greater facilities should be provided for obtaining mining and technical education, and should be brought within the reach particularly of the younger workmen who show special aptitude and ability. Among other means to this end mining scholarships should be provided.

Power Production and Fuel Economy.

The concluding document is a report by the Carbonisation Sub-committee which deals with the gas and coke industries, fuel economy in iron and steel manufacture, and power production and fuel economy. On the latter subject the report says that in the report of the Sub-committee on Power Generation and Transmission, the question of fuel economy is dealt with mainly from the point of view of the generation of steam in large modern power house units in which coal is burned directly under the boilers.

In conferences between the vice-chairman of the Power Sub-committee and the vice-chairman of this Committee it was agreed that the introduction of carbonisation and gasification processes for the preparation of the raw coal as a preliminary to its use for steam raising, was still an open question and that pending fuller research on all the issues involved, the only practical course to follow in the planning of "super-power stations" was to leave room in the original lay out for the introduction of carbonisation or gasification plant should it be subsequently proved that it would be feasible technically and economically to do so.

In the report of the Fuel Research Board on their scheme of research and the establishment of a fuel research station considerable prominence was given to this subject and the steps which it is proposed to take are clearly outlined.

While electric power engineers are practically agreed that the only feasible method of power production in large central stations is by the use of large turbo-generator units, the Sub-committee consider that there is a definite field for the use of gas engines in special circumstances and in cases where the most suitable units are of relatively small size, say under 3,000 to 4,000 KW. They hope and believe that the design and production of internal combustion engines will be greatly forwarded by researches which are already in progress; and that later, under the stimulus of reconstruction demands, important developments will take place both in the design and use of these engines.

The report of the Fuel Research Board above referred to contains the following :—

There is a very general belief among electrical experts that the future of British industry will be greatly affected by the cost at which power in bulk can be supplied in the form of electricity. It has been suggested that the cost of producing power from coal in this country would be substantially reduced if, instead of burning the coal directly under the steam boilers, it were first subjected to carbonisation and gasification processes which in addition to fuel gas would yield valuable by-products. Plausible statements have been issued showing the enormous savings or profits which would accrue if schemes of this sort were adopted. Unfortunately, these estimates have generally been made on a very slender foundation of knowledge and experience. On the other hand, those who by

Digitized by Google

experience and practice are best qualified to judge, hesitate to prophesy as to what the economic result of a combined carbonisation and power-generating scheme would be, but they agree that the interests at stake are so great that the question ought to be authoritatively answered once for all. But no answer can be accepted which is not founded on the complete working out of the scheme, no important step in the series of operations being omitted or slurred over. This series of operations will start from the mechanical preparation of the coal and its conversion into solid, liquid and gaseous products by carbonisation. It will end with the delivery of a known weight of high-pressure steam under the conditions most favourable for power production by turbo-generators. In the proposed scheme of research the investigation of each of the steps involved in the above enquiry is provided for. Three, at least, of these steps involve pioneering work on an industrial scale and the work may occupy a considerable time. The Board realise that it is possible that the net result of this particular enquiry may be to show that, purely as a means of cheapening the cost of electric power, the use of carbonisation methods has not much to commend it, but that certain incidental advantages will justify its use in particular cases.

BRITISH SCIENTIFIC PRODUCTS EXHIBITION.

The British Scientific Products Exhibition at King's College, London, which was open from August 12 to September 7, contained a great deal that was of interest and value from a scientific and industrial point of view. In the words of Professor R. A. Gregory, chairman of the organising committee, "The aim of the exhibition was to stimulate public interest and confidence in the capacity of British science, combined with industrial enterprise, to secure and maintain a leading place among progressive nations; and the object is the full development of our mental and material resources." Among the exhibits of direct interest from the point of view of traction were those of electrical appliances, chemical products and processes, and gas vehicular equipment.

Abbott, Anderson and Abbott, Limited, 4, Dod Street, Limehouse, E.14, showed their brand of all-British varnished insulating cambrics and silks.

Exhibits designed to render apparatus immune from shorts were a feature of the entry of the British Central Electrical Company, Limited, 6-8, Rosebery Avenue, E.C.1.

The British Ignition Apparatus Association (among the members of which are the British Thomson-Houston Company, Limited, the British Westinghouse Electric and Manufacturing Company, Limited, and C. A. Vandervell and Company, Limited) showed magnetos for car, lorry, cycle, and other types of internal-combustion engines. The exhibit included a selection of magnetos, of the materials used, and of dissociated parts of magnetos.

The Concordia Electric Wire Company, Limited, New Sawley, Derbyshire, showed silk-covered instrument wires.

Among the exhibits of Crompton and Company, Limited, Chelmsford, was a combined ammeter and voltmeter for electric battery and petrol-electric vehicles.

A hand-automatic electric welding machine was shown by the Electric Welding Company, Limited, 28, Basinghall Street, E.C.2.

Samples of ammeters, voltmeters, and photometers were contributed by Everett, Edgcumbe and Company, Limited, Hendon, N.W.9.

Electrical measuring instruments of the indicating and recording pattern, for current pressure and power, were a feature of the exhibit of Evershed and Vignoles, Chiswick, W.4.

Fuller and Son, Limited, Chadwell Heath, Essex, and their associated companies showed a variety of accumulators, ignition coils, dynamos, switchboards, insulated wires, and cables, and other electrical requisites.

Hadfields, Limited, Sheffield, had placed on view samples of "Hadura" hardened steel rolls for cold-rolling steel and other hard metals. "Era" manganese steel was also shown. The firm's research department contributed slide-rules for facilitating calculations met with in metallurgical work. A specially noteworthy exhibit was the firm's large metallurgical temperature chart.

Thermit, Limited, 675, Commercial Road, E.14 (the proprietors of which are Nobel's Explosives Company, Limited) had an exhibit of special interest, as providing an example of the production by British chemists of a series of compounds and metallurgical products, which were previously made in Germany. These comprise carbon-free metals and alloys of all kinds. Samples of Thermit welds were also on view.

The London General Omnibus Company, Limited, exhibited a standard London omnibus (body removed), with design of gas-fuel system under compression, representing the equipment approved by the Gas Traction Committee and the Commissioner of Police for a London motor omnibus service. A detailed illustrated account of this equipment appeared in the issue of the TRAMWAY AND RAILWAY WORLD for August 15.

Other interesting exhibits in the gas traction section included the Murphy "Safe" cylinders shown by Lyon, Limited, of New Bond Street. This is wrapped with three layers of high tension steel tape, and is similar to the cylinders designed by the engineers of the London General Omnibus Company. It has been demonstrated before the members of the Gas Traction Committee to be capable of withstanding a pressure of 3,500 lb. to the square inch, and is extremely light in weight (132 lb.). The capacity of the cylinders is 250 cubic feet. Another novelty in high-pressure gas containers was shown by Mr. A. W. Torkington, of Stelastic Tyres, Limited, York Street, London, S.W. This container is composed of close, strong, interwoven steel wire, so constructed that there are no joints, and consequently no weak places. Inside this armoured jacket is a strong rubber tube, so shaped as to give an even pressure against the outer cover. The size of the container shown was 45 inches long by 8 inches in diameter, but larger sizes can be made if desired. No particulars of the capacity were given, but inquiries were invited. A number of model containers of the flexible variety were shown, together with specimens of proofed fabric used in the construction of the containers. The British Automobile Traction Company exhibited a model of the composite container as constructed in the works of the East Kent Road Car Company, at Canterbury. The British Rubber Manufacturers, Limited, Lyon, Limited, and Messrs. Barton Brothers, of Nottingham, the pioneers of the flexible container—each exhibited a model of the particular type manufactured by them. An exhibit that attracted considerable attention was the Flugel gas carburetter. This has been specially designed for gas-driven cars, the special nature in its construction being the fact that both the gas and air valves are actually operated by the pedal acceleration. Economy in consumption is thus ensured.

OMNIBUS QUEUES FOR LONDON.

POLICE AT LAST STIRRED TO ACTION.

The persistence of numerous Borough Councils of London in urging upon the Commissioner of Police the desirability of co-operating with the London General Omnibus Company in instituting the queue system for passengers has made an impression in the desired quarter. Early in August the Commissioner sent to the Kensington Council the proposals submitted by the company, and invited the Council's observations thereon.

The Commissioner pointed out, however, that while the present scrimmages are undesirable, it is not easy to regulate passengers into queues without serious inconvenience and danger to other persons passing along the foot pavements, and obstruction to frontagers opposite whose premises queues are formed. The Commissioner is anxious to give the queue system a trial in connection with omnibuses wherever it appears probable that good results may ensue, but it would not be practicable to detail police especially to regulate queues if such a system were carried out to any considerable extent, except by an augmentation of the police force, which would throw an additional burden on the ratepayers.

In commenting upon the Commissioner's letter, the General Purposes Committee of the Council reiterate their opinion that the proposals submitted by the company should be given a trial. Further, they report that the police have informed the company that they must obtain and retain the consent of frontagers affected before their proposals are put into operation. The police consider it to be undesirable that the footways should be encroached upon by the erection of indicating posts, and have asked that the queue signs should as far as possible be suspended by brackets from buildings or structures.

The Council have informed the company that they will not raise objection to the indicating posts being placed in the public footway at the several places in Kensington where it is proposed to form queues, subject to the work being carried out to the approval of the Council, and to their approval of the description of posts.

The Home Secretary recently stated in the House of Commons that omnibus queues had been established at certain points, and the police were anxious to extend the system wherever it could be done without unduly interfering with the rights of frontagers.

EDINBURGH GAS OMNIBUS COSTS.

Addressing the Waverley Association of Gas Managers at Edinburgh at their annual meeting, Mr. J. Richmond, the president, quoted statistics of the running costs of gas motor omnibuses, which he had received from the general manager of the Scottish Motor Traction Company. The flexible containers cost approximately £50 each. The containers were subjected to considerable wear, the cost of upkeep being 1¼d. per mile. The cost of gas was equal to 2·17d. per mile, and with wages of the attendant at the filling station the total cost per mile was 3½d. Although this amount was double the cost of running with petrol before the war, it effected a considerable saving compared with petrol at its present price. Two hundred and fifty feet of gas was found to be equivalent to one gallon of petrol.

Digitized by Google

TESTING DEPARTMENTS FOR ELECTRIC RAILWAYS.

Mr. H. Le Smith, in an interesting article in the *New York Electric Railway Journal*, shows in how many directions a testing department can effect economies in electric railways. The work of such a department falls into three main sections so far as concerns new material, viz., continuous supplies, apparatus for extensions or improvements tested for acceptance, materials and apparatus on trial. Inspection during manufacture and testing for deterioration are important branches. Deterioration tests aid in maintaining efficiency, and avoiding breakdowns. Tests designed to show the most economical method of operation and maintenance offer possibilities of enormous savings. The best control of the heat balance of a power-station can be obtained only by reference to the results of tests.

The use of condensate as feed-water generally involves daily laboratory tests, if satisfactory results are to be obtained. A standard of "allowable leakage" from condenser tubes must be established, beyond which it is preferable temporarily to throw away the hot water and use fresh water supply. Scale prevention cannot be ensured save by aid of control tests; and the same applies to eliminating priming difficulties. Any test which aids in maintaining the highest possible vacuum in turbine plant is well worth while. Adequacy of circulating water flow, air leakage, and efficiency of air removal can only be controlled by tests. A simple gasometer device is described which facilitates control of air leakage. Factors influencing the maintenance of vacuum are discussed in some detail.

There is room for daily tests in one phase or other of boiler operation. Calibration of the station watt-hour meters ensures accuracy at the very heart of all measurements of energy delivered and cost thereof. The accuracy of other switchboard instruments is hardly less important, and the same applies to gauges on the boilers and steam and air lines, etc. The adjustment of relays and the checking of instrument transformers is important work. The author makes a number of practical suggestions in all these branches of the subject, and concludes with notes on the organisation of a testing department.

WOMEN CONDUCTORS.

ADVERSE REPORT FROM NEW YORK.

Reporting on the employment of women conductors on the street cars of New York, the Department of Labour says:—"It is practically impossible to make the conditions of street railway employment even tolerably endurable to women, and the operation of cars is one of the last occupations into which women should be lured or forced. Those who advocate the employment of women as street car conductors have given scanty consideration to irregularities of hours. The principle has been clearly established that a woman cannot work at employment requiring constant standing without seriously endangering her health. Moreover, the conductor is exposed to cold, damp, and draughts even in the best type of enclosed vestibule cars and centre door cars. The point has been made repeatedly by the companies in the investigation that even when women have a choice they frequently select night runs. At this time the cars are less crowded and the work less strenuous. Some of the women have remarked that they preferred the night runs because it left them the day free to do other things. Others with families have said that night runs enabled them to look after the children and prepare meals during the day. The disastrous consequences of employing women on night work to enable them to work all day for their families have been so thoroughly demonstrated in other industries that it needs no further demonstration in street car operation."

The employment of women has not lowered the wage scale, the women being paid as much as the men formerly employed, but has probably, the report states, prevented wages from rising.

Hydro-Electric Power Scheme.—A remarkable scheme for the development of hydro-electric power to be derived from the waters of the Liffey is now under consideration. The promoters are the Dublin and Lucan Electric Railway Company, whose secretary, engineer, and manager, Mr. D. McDowell Grosart, J.P., suggested the idea, when he was appointed to his present position a few years ago. The probable cost of the scheme is put at £50,000. The saving of coal which would be effected by the scheme is estimated at over 16,000 tons per annum.

High Price for Second-hand "Halley" Vehicles.—At a public sale at Barrhead recently, exceptionally high prices were obtained for two motor lorries, both built by Halley's Industrial Motors, Limited, of Yoker, Glasgow. A 2-ton 25-H.P. lorry built in 1911, and a 3-ton 35-H.P. lorry built in 1915 together sold for £1,900 after keen competition.

A CANADIAN TRAMWAY ADVERTISING CAMPAIGN.

A noteworthy advertising campaign undertaken by the Montreal Tramways Company is described in the *Electrical News* of Toronto. It appears that the Montreal Tramways Commission has conceded the company the right to increase the fares, but an effort is being made to prevent the carrying out of the project. With a view to bringing home the justice of their case to the public, the company has been advertising in the newspapers. It is pointed out how the unprecedented increase in the cost of materials eats up earnings rapidly. It takes nearly twice as many fares to pay for the Montreal Tramways Company's supplies as it did five years ago. A detailed list of increased prices, as compared with the prices current in 1913, is given. Another advertisement contains a list of fares recently allowed to be charged on street railways in the United States. Advertising on similar lines has also been done by the Cape Breton Electric Company, which operates a tramway at Sydney, Nova Scotia. In one of a series of "one minute tram talks," it is urged that "Your prosperity and ours go hand in hand," and "if we are not prosperous we cannot furnish good service."

SLACK HOUR SHOPPING AND FUEL.

A recent issue of the news sheet of the San Diego Electric Railway, California, states that the women of the city have proved the worth of the company's suggestion that greater comfort in travel could be secured by doing their shopping during the slack hours of the morning and afternoon. In addition the assistants in the shops are able to give customers better attention than during the busy hours. The writer of the note adds:—"Besides this there is an item of fuel conservation that should be considered by everybody. When more cars are put on to take care of the rush of travel during any period just that much more fuel is of a necessity used which would not be if patronage were more equally distributed throughout all hours of the day. Will you try to aid us to the extent suggested in doing what the Government demands that we shall do, conserve fuel in every possible way?"

AGE LIMIT FOR DRIVERS REDUCED.

For some time past the increasing shortage of drivers of commercial motor vehicles has induced the Commercial Motor Users' Association to suggest to the Local Government Board that the age limit at which licences can be issued should be temporarily reduced. It has now been notified that a new Defence of the Realm Regulation has been issued providing that in future a licence under the Motor Car Act, 1903, limited to the driving of a motor car other than a heavy motor car or a public service vehicle, may be granted to a male person who has attained the age of 16 years if the authority granting the licence is satisfied that he is competent to drive such a car. A heavy motor car is defined as a "motor car exceeding two tons in weight unladen," and "public service vehicle" as a "motor car licensed to ply for hire as a hackney carriage or a stage carriage."

London School of Economics.—The calendar for 1918-19 of the London School of Economics and Political Science (University of London) shows courses of study which seem to be more numerous and complete than ever before. The subjects dealt with include a number of special interest to tramway and railway men, as, for example, general economics with special reference to transport, accounting, scientific management in factories, railway operating, law of carriage, the railway system as a wealth-creating machine, cost accounts and efficiency methods and railway rates and charges. It is noted that in view of the large number of railway students of the school who are now serving with the colours the activities of the Railway Students' Association are at present in abeyance.

Tramways and Light Railways Association.—The journal for August contains a report of the tenth annual congress held on July 12. The names of the members of the Council given in the journal show that Mr. G. M. Harriss, general manager of the Dublin United Tramways Company, and Mr. G. W. Holford, general manager of Salford Corporation Tramways, have retired, and that Mr. A. L. Barber, secretary of the Metropolitan Electric Tramways, and Mr. H. L. White, manager and engineer of Great Grimsby Street Tramway Company, have been elected by the Council to fill the vacancies thus created.

Railwaymen's Wages.—The Railway Executive Committee is stated to be giving favourable consideration to the railwaymen's further claim for an increase in wages. Another meeting with the men's representatives is being arranged.

Edinburgh to Queensferry Tramway.—A public inquiry will be held on October 1 into the application of the Edinburgh Corporation for power to construct an electric tramway to Queensferry.

Digitized by Google

FINANCIAL REPORTS AND MEETINGS.

DIVIDENDS.

HONG-KONG TRAMWAY COMPANY, LIMITED.—An interim dividend of 7d. per share has been declared.

LANARKSHIRE TRAMWAYS COMPANY.—A dividend of 7 per cent. per annum (7s. per share) for the half-year has been declared.

BLACKPOOL AND FLEETWOOD TRAMROAD COMPANY, LIMITED.—An interim dividend of 4s. per share, free of income-tax, has been declared.

WALTER SCOTT, LIMITED.—A final dividend of 10 per cent. on the ordinary shares, making 15 per cent. for the year ended June 30, has been paid.

BRISTOL TRAMWAYS AND CARRIAGE COMPANY, LIMITED.—An interim dividend at the rate of 6 per cent. per annum on the ordinary shares has been declared.

OLDHAM, ASHTON AND HYDE TRAMWAYS COMPANY, LIMITED.—An interim dividend has been announced at the rate of 5 per cent. per annum on the ordinary shares.

CHATHAM AND DISTRICT LIGHT RAILWAY COMPANY.—An interim dividend at the rate of 8 per cent. per annum (8s.) has been declared on the ordinary shares for the half-year.

W. T. HENLEY'S TELEGRAPH WORKS, LIMITED.—A dividend on the preference shares at the rate of 4½ per cent. per annum for the half-year ended June 30, and an interim dividend on the ordinary shares of 2½ per cent. has been declared.

GUEST, KEEN AND NETTLEFOLDS, LIMITED.—Final dividends on the preference shares at the rate of 5 per cent. per annum, and on the ordinary shares at the rate of 10 per cent. per annum for the half-year ended June 30, together with a bonus of 1s. per share on the ordinary shares. all free of tax, have been paid.

GLASGOW SUBWAY.—An interim dividend of 1¼ per cent. is announced on preference shares, against 1 per cent. last year. The increase in dividend, it is stated, is made in order to equalise more nearly the two half-yearly payments, and must not be taken as an indication of an increase in the dividend for the full year.

NORTH EASTERN STEEL COMPANY, LIMITED.—The net earnings for the year, after providing for estimated liabilities to the Government, amount to £88,500, as compared with £85,300 for the previous twelve months. The dividend is maintained at 10 per cent., free of income-tax, and £20,000 is added to the reserve, the balance carried forward being increased from £4,600 to £8,200.

Glasgow Corporation Tramways.—The accounts for the past financial year showed a surplus on the tramways undertaking of £177,552, an increase of £16,568 on the previous year, which surplus had met to the extent of £25,584, what would have been a deficiency on the accounts.

Oldham Corporation Tramways.—The receipts from traffic for the year ended March 25 were £148,582 5s. 3d., compared with £124,957 10s. 5d. in the previous year. Working expenses were £106,937 15s. 9d., compared with £85,443 4s. The number of car-miles run was 2,121,092, against 2,010,604, and the number of passengers carried 28,703,371, against 24,670,848. The total revenue from the motor omnibuses was £599 8s., and the working expenses £1,507 19s. 11d.

West Bromwich Corporation Tramways.—The report of the year ended March 31 states that after charging interest on loans and sinking fund instalments the deficit for the year amounted to £545 7s. 3d. After deducting the credit balance at March 31, 1917, there remained a net deficit on the revenue appropriation account of £281 13s. 9d. The deficit in the working account on the motor omnibuses amounted to £464 4s. 5d., and after charging interest on loans and sinking fund instalments there is a deficiency of £1,767 18s. 1d.

Croydon Corporation Tramways.—Reports on the last financial year's working show that the surplus of £11,220 compares with a deficiency of £1,633 14s. 5d. for the previous year. The net increase of income was £20,963, and the net increased expenditure was £8,890. On the expenditure side the principal increases were as follows:—Wages of motormen and conductors, £2,077; power expenses, £2,080; war bonus, £3,312. The expenditure charged to the reserve and renewals fund for the year amounted to £1,450 11s., and the balance of the fund at March 31 was £43,528 15s. 10d. There had been no capital expenditure during the year.

Brazilian Traction, Light, and Power Company, Limited.—The report for the year ended December 31, 1917, has been issued. The tramway receipts exceeded those of 1916 by 4·27 per cent., and the increase in net earnings—1,108,835 milreis—exceeds the increase in the gross earnings for the same period, and is also greater than the increase in net earnings in any year since 1913. The net revenue for the year was 5,266,518 dollars. The aggregate reduction in the net revenue of 9,800,000 dollars for the last three years is attributable to the decline in exchange from the rate prevailing in the five years preceding the war. The earnings in Brazilian currency each year have shown substantial gains.

Birmingham Corporation Tramways.—The statement of accounts for the year ended March 31 shows a total revenue of £990,424, as compared with £838,725 for the previous year. Passengers numbered 198,402,908, as compared with 171,445,020. The total expenditure was £755,980, as compared with £632,165. The gross profits were on tramways £234,444, and on motor omnibuses £13,212, as compared with £206,560 and £10,085. The net profits, after deducting interest and sinking fund charges, amounted to £101,700, as compared with £76,291 for the previous year. The net profit was disposed of as follows:—Transferred to reserve fund, £63,889; transferred to suspense account, £12,801; contributed in relief of rates, £25,000.

West Ham Corporation Tramways.—The report for the year ended March 31 states that the expenditure amounted to £168,826, an increase of £18,837. The income was £188,851, as compared with £166,142, an increase of £22,708. If the sum paid as allowance to men on active service were excluded, there would have been a gross profit on working of £20,024. Including these allowances there is a surplus of £3,263 to be carried to net revenue account. Repayment of mortgage loans, contributions to sinking funds, and interest required £31,635, thus leaving a deficit of £28,177. Excluding the amount of £16,761 allowances to men on active service, the deficit would have been £11,415. The reserve and renewals fund being exhausted, all future expenditure for renewals will become a charge upon the revenue account.

Wolverhampton Corporation Tramways.—The accounts for the year ended March 31 show that the gross profit on electric traction account was £29,849 15s. 2d. To this sum is added the balance of £2,189 4s. 6d. on motor chars-a-banc account, making a total of £32,038 19s. 8d. This has been allocated as follows:—Interest on capital, £5,616 4s. 8d. (less interest received); income tax on profits, £307 10s. 7d.; repayment of loans, £6,218 13s. 5d.—£12,151 8s. 8d. Amounts appropriated to additions and improvement, £198 5s. 6d.; reserve and renewals fund, £4,351 9s. 9d.; maintenance and repairs suspense account, £8,766 15s. 9d.; in aid of borough rate, 1918-19, £6,580—£19,896 11s.—£32,038 19s. 8d. The sum of £56,683 now stands to the credit of the reserve and renewals fund, and £19,427 7s. 10d. to the credit of the maintenance and repairs suspense account.

Western Wagon and Property Company, Limited.—An interim dividend for the half-year ended June 30, at the rate of 10 per cent. per annum, has been declared. Receipts amounted to £110,548, working expenses to £78,626, and war allowances to £5,801. The gross balance was £28,369, from which £17,149, interest on capital, contribution to sinking fund, and income tax had to be deducted. The gross balance was equal to 9·89 per cent. on the capital outlay, and the net balance of £11,220 was equal to 3·91 per cent. Traffic receipts had increased by £20,947, or 23·64 per cent., which was attributable to the increased number of passengers carried, namely, 3,696,833, and to the fact that the previous year contained nine months of revised fare charges. The figure of £100,000 had been reached for the first time in the history of the undertaking, and the receipts were £16,000 higher than the previous best (1915-16).

Aberdeen Corporation Tramways.—At a meeting of the Aberdeen Town Council, the Tramways Committee recommended that the third of the free surplus revenue of the tramway undertaking for the year, amounting to £4,070 13s. 8d., should be applied as follows: To the common good of the city, £2,000; in carrying out city improvements, £2,070 13s. 8d. Councillor Robertson, in presenting the recommendation, said the difficulty with the department was not the question of how to increase the receipts, but rather how to carry the passengers. They had one new car almost ready, and two others were being built, also spare parts and material. Mr. Pilcher, in his twelve years' service, had shown marked ability and skill, not only as manager, but as engineer, and they wished him all success in his promotion. The success of the service was due to splendid organisation. The Lord Provost seconded, endorsing the appreciation of the manager's excellent work. The recommendation was adopted.

Portsmouth Corporation Tramways.—The financial statement for the year ended March has been presented by the chairman of the Tramways Committee, Councillor J. Timpson. The statement showed that the revenue amounted to £153,087, comprising traffic receipts, £123,494; special cars and fares, £280; cheap tickets, £27,471; and advertising on cars, etc., £1,842. The expenditure amounted to £127,165, as follows:—Working expenses, £70,841; grants to dependants, £4,001; war bonus to employees, £5,447; principal and interest charges, £39,860; and income tax, £7,016. This gave an excess of revenue of £25,922, which, with £1,350 as interest on credit balances, left for appropriation the sum of £27,272. The balance for appropriation the previous year was £18,580, of which £14,000 was devoted to the relief of the rates. The balance was £8,692 larger this year, and it was proposed to dispose of the £27,272 as follows:—£6,078 to be placed to the renewals fund; £2,000 to the reserve and insurance fund; £15,000 in aid of the rates; and £4,194 to be carried forward for the current year. £15,000 represented nearly a rate of 4d. in the £. The total handed over to the relief of the rates since the tramways had belonged to the Corporation was £130,500.

Digitized by Google

LEEDS CITY TRAMWAYS.

The report of Mr. J. B. Hamilton, general manager of the Leeds City Tramways, for the year ended March 31, states that the receipts amounted to £586,631, an increase of £70,824. The working expenses, on the other hand, at £314,042, show an increase of £53,157, leaving a gross profit of £272,588, an increase of £17,668. The increased costs are attributed mainly to increases in wages, which amount approximately to £43,000 more, while the annual cost of war bonuses to employees amounts to £90,000. Material has, of course, greatly increased in value, and among the items is an increase of £3,543 under the head of ticket check, largely due to the increased cost of paper. An advance in the price of coal of 2s. 6d. per ton authorised by the Coal Controller in 1917 has added £1,200 to the fuel bill. Owing to the 50 per cent. advance in railway fares, there was an increase of 57 per cent. in the number of through tickets issued between Leeds and Bradford. A summary of the income and expenditure account and of the application of the gross profit for the past four years is appended :—

Year ended March 31.	1918.	1917.	1916.	1915.
INCOME—	£	£	£	£
Traffic revenue	577,168	507,755	467,197	429,903
Advertising	2,941	2,943	2,620	3,915
Mineral haulage	1,794	1,397	634	—
Rents	4,728	3,711	5,054	121
Discounts	—	—	—	—
Total revenue	586,631	515,806	475,505	433,940
EXPENDITURE—				
Traffic—	158,282	130,245	114,724	115,601
General	43,942	40,141	41,190	40,347
Repairs and maintenance	73,606	55,084	42,786	43,609
Power expenses	38,212	35,415	16,837	14,035
			15,178	14,542
Working expenses	314,042	260,885	236,227	228,134
Gross profit	272,588	254,920	239,278	205,805
Bank interest	3,309	2,379	4,413	1,344
Dividends on investments	12,989	7,377	5,867	6,493
	288,888	264,676	249,558	213,642
Interest on property	3,953	3,943	3,218	2,647
Interest on capital	53,743	49,777	49,444	44,527
Income-tax	23,257	17,847	15,349	7,357
Rent of lines	2,964	3,018	3,071	3,125
War allowances	12,053	12,890	13,272	4,460
Balance	193,187	177,201	165,204	151,526
BALANCE APPROPRIATED AS FOLLOWS—				
Redemption fund	66,881	64,205	72,489	57,773
Cost of Acts	445	445	703	258
Renewals	61,764	30,000	3,146	11,928
Contribution to capital outlay	2,742	2,373	—	—
Third Party risk reserve	—	747	2,044	—
Reserve fund	3,352	—	15,000	—
Net surplus to relief of rates	58,000	79,431	71,822	81,567

THE WOODS-GILBERT SYSTEM.

In the latter part of August subscriptions were invited for £10,000 10 per cent. non-cumulative preference shares of £1 each in the Woods-Gilbert Rail Remodelling Company, Limited, the capital of which is £30,000, divided into 7,500 10 per cent. cumulative participating preference shares, 10,000 10 per cent. non-cumulative participating preference shares, and 12,500 ordinary shares, all of £1 each. The prospectus stated that the company had been formed to acquire from the Woods-Gilbert (British) Rail Grinding and Milling Company, Limited, its whole business of tramway rail remodelling, for which it holds the exclusive patent rights in Great Britain. The company's chief business will be to renovate *in situ* tramway rails which are considered by the owners to be worn out. The work is done by special machines (such as have been described in our pages). The work undertaken by these machines consists of four separate operations to remedy the defects of worn rails, viz., deepening the groove and reducing high checks by means of a milling tool, and removing corrugations and dressing joints by means of a rapidly revolving grinding wheel. In most instances the rails have sufficient metal beneath the groove to enable additional life to be given of from five to eight years if milled out. The maximum cost of applying the Woods-Gilbert system should not exceed £1,000 per mile, and for this about 50 per cent. of additional life is obtained.

The 5,329 miles of tramway track in Great Britain are in many cases in a defective condition, and there is a great demand for the Woods-Gilbert system of remodelling. To meet this demand the Ministry of Munitions have granted authority for the construction of five machines, in addition to the three at present at work. The cost of these new machines will be between £2,200 and £2,500 each, and three such machines have already been put in hand and will be ready for delivery within the next three months. These machines are already booked up on contracts which will keep them employed for fully twelve months. Negotiations are also pending with other tramway owners, which are fully expected to mature into contracts as soon as an approximate date can be given for the commencement of the work.

This system of rail remodelling was first introduced in Australia, where a considerable mileage was completed for the Melbourne, Brisbane, Adelaide, and Sydney tramways. Work has also been completed in this country on the Oldham, Ashton and Hyde, Cardiff, Isle of Thanet, Bexley, Wigan, and Bolton tramways, and work will shortly be commenced for the Huddersfield, Middleton, and London United tramways. Since the inception of the vendor company in 1916, its operations have been conducted at a profit, and regular dividends have been paid. When the three new machines are put to work, the profits will be still further increased

PERSONAL.

Mr. B. Ll. Morgan, borough engineer of Bolton, has been granted an increase in salary from £1,000 to £1,200 a year.

Mr. J. A. Davidson, mechanical engineer at Belfast Corporation electricity station, has resigned owing to ill-health.

Mr. Ernest Hatton has been acting as district engineer in the coal economy campaign for the important Tyneside area for some time.

Mr. T. J. Kendrew, general manager of the Southport Corporation Tramways, has been granted an increase in salary from £300 to £400 per annum.

Mr. T. P. Smith, electrical engineer of Leicester Corporation, has been appointed district engineer to the local department of the Coal Controller.

Mr. Frank Ayton, engineer and manager of Ipswich electric supply and tramways departments, has been granted an increase in salary from £700 to £850.

Mr. R. L. Acland, electrical engineer and tramways manager of Chesterfield, has been appointed by the Controller of Coal Mines to be district engineer for assisting in the coal economy campaign.

Mr. C. Hornby, who until recently represented the Shrewsbury and Challiner Tyre Company, Limited, in Liverpool, has been appointed manager of the Company's Scottish business, with offices at 86, Gordon Street, Glasgow.

Mr. J. B. Hamilton, general manager of the Leeds City Tramways, has been engaged to give the Stockton Town Council expert advice in connection with the question of exercising the rights of purchase of the tramway undertaking in the borough.

Mr. B. Hall, of the Chatham and District Light Railways, has been presented by his colleagues with a case of instruments and pipe on his leaving to take up the position of assistant engineer and manager of the Keighley Corporation Tramways.

Lieut. (Acting Captain) R. B. Wilmshurst, Lincs. Regiment, who has been awarded the Military Cross for gallantry and devotion to duty by subduing a fire amongst ammunition, is the youngest son of Mr. T. B. Wilmshurst, electrical engineer for the borough of Derby.

Mr. H. P. Stokes, M.I.E.E., A.M.I.Mech.E., general manager and electrical engineer to the Bexley Urban Council electricity and tramways department, and Dartford light railways, has been appointed district engineer in connection with the coal economy campaign.

Second Lieut. Wm. C. McCallum, R.E., before the war a member of the engineering staff of Messrs. Dick, Kerr and Company, we noted some time ago had been awarded the Military Cross. The award has now been notified officially in the *London Gazette*, with the following paragraph describing the action for which the honour was conferred :—"For conspicuous gallantry and devotion during a hostile attack. It became evident when the bombardment commenced that the horses and vehicles would have to be withdrawn. In spite of a heavy and continuous bombardment he personally superintended the packing and dispatch of all the vehicles and succeeded in saving the entire equipment and horses of this section. Throughout the day he set a splendid example to all ranks."

The Late Major Bertram Hopkinson.—It is with regret that we record the death of Major Bertram Hopkinson, which was caused by an accident on duty in the north-east of London. Since 1916 Major Hopkinson was Deputy Assistant Director to the Air Ministry, and from 1903 onwards he held the position of Professor of Mechanism and Applied Mechanics in the University of Cambridge. Major Hopkinson was a member of the famous family of that name, who have done so much for applied science, and particularly for electric traction, his father being the late Dr. John Hopkinson, F.R.S. For some time he was a consulting engineer, and in partnership with Mr. Charles Hopkinson and Mr. Ernest Talbot he carried out the design of the electric tramway systems of Leeds and Newcastle. He was a Fellow of the Royal Society, and was last year made a Companion of the Order of St. Michael and St. George.

CONTRACTS AND ORDERS.

Lancaster Corporation have ordered two sets of machine stokers from Bennis and Company, Limited.

Manchester Tramways Committee have accepted the tender of Fred. Smith and Company, of Salford, for trolley wire.

Bradford Tramways Committee have ordered gear wheel castings from Edgar Allen and Company, Limited, and Cammell Laird and Company, Limited.

Digitized by Google

TRAMWAY AND LIGHT RAILWAY NOTES.

BEXLEY.

PURCHASE OF CARS.

Bexley Urban Council have bought twelve cars from the London County Council at £550 each, subject to 5½ per cent. for each car until receipt of the purchase money.

BURTON-ON-TRENT.

HIRE OF CARS.

It has been proposed to hire cars from Yarmouth for use in Burton-on-Trent.

COLCHESTER.

A WEEKLY REST DAY.

The Colchester Town Council is arranging for drivers and conductors to have one day's rest a week without reduction of wages.

CROYDON.

TRAMWAYS UNDER THE MUNITIONS ACT.

The Croydon Corporation Tramways have been certified under the Munitions of War Act of 1917, on the ground of the importance of the undertaking as contributing to the carrying on of munition work, presumably with a view to the issue of an order directing the Corporation to pay the employees the bonus under the recent award of the Committee of Production.

DEWSBURY.

THE CALL-UP.

Mr. W. MacGibbon, local manager of the Dewsbury and Ossett Tramways, has informed the Dewsbury Town Council that his men have been called up to such an extent that, unless time is allowed to train others, the services between Dewsbury and Ossett and Earlsheaton will have to be suspended.

EDINBURGH.

QUEENSFERRY TRAMWAY SCHEME.

The Edinburgh City Council has asked the Admiralty for a statement of their position with regard to the proposed Edinburgh-Queensferry tramway, and the Admiralty has undertaken to reply at an early date. Considerable importance attaches to the traffic which will be contingent on the Admiralty developments on the Forth, and the statement of the Admiralty is awaited with much interest. The Council received a deputation from the Edinburgh Trades Council in support of the scheme. Several members of the deputation referred to the connection between tramway extension and increased housing accommodation.

HULL.

CONSCIENTIOUS OBJECTORS NOT ENGAGED.

The Hull Corporation Tramways Committee, having been asked by the local branch of the National Federation of Discharged and Demobilised Soldiers and Sailors to place the claims of ex-service men before those of conscientious objectors, have decided not to entertain applications of two conscientious objectors to be employed as drivers.

KEIGHLEY.

ACTION AGAINST CORPORATION.

The Keighley Corporation were sued in the Keighley County Court for damages in respect of a collision through a Corporation car striking a cart as it was being driven across the road. It was urged for the plaintiff that a vehicle limited, as was a tramway car, to a defined track should be driven with more than ordinary care, and that this had been wanting. For the defence it was submitted that the car was only travelling at six to eight miles per hour, and the driver did all in his power to avoid the accident. The judge found for the defendants, with costs.

LEEDS.

PLANS FOR THE FUTURE.

Leeds Tramway Committee favour the construction of wide roads in the suburbs with tramway tracks in the centre, separate from the rest of the road, upon which a fast service of cars could be maintained. They have decided to confer with the Improvements Committee on the details of housing and town planning schemes which are now engaging attention. Members of the Tramways Committee visited Liverpool recently, and inspected the wide roads laid out in the suburbs of that city prior to building developments. Some of these roads, as described in the TRAMWAY AND RAILWAY WORLD, are sufficiently wide to have a line of trees on either side, broad footpaths, and a special tramway track in the centre.

LIVERPOOL.

KILLED BY A FALLING TROLLEY.

At an inquest at Liverpool the jury found that death had been caused by a blow from a trolley which fell from a tramway car, adding that there was not sufficient evidence to show what caused the trolley to fall. It was stated that the car had been passed as in perfect running order before leaving the depot. The mishap was attributed to the lock-stud at the base of the trolley becoming detached.

LLANDUDNO.

TEMPORARY INCREASE IN FARES.

Owing to the pressure of traffic on Llandudno electric tramways, the penny fares are suspended for two months in order to reserve the accommodation for passengers using the cars for longer journeys.

LONDON.

THROUGH SERVICE—USE OF COKE—CARS FOR GOODS.

The London County Council and the Metropolitan Electric Tramways have arranged for an additional through service via Stamford Hill. At one of the power-stations of the Council coke is being extensively used, and arrangements have been made for the supply of from 100 to 1,000 tons of coke per week for twelve months. The Council is converting two cars for the carriage of goods for experimental purposes at an estimated cost of £100.

NEWPORT.

PROPOSED TRAMWAY EXTENSIONS.

The Newport Town Council have been asked by the Admiralty to estimate for the cost of extending the tramways from certain works to the docks with a view to conveying workmen to and from. It has been reported that a double track would cost £34,317, and a single track with loops £28,517. It is proposed to contribute the pre-war cost of the line and the cars, and to bear 50 per cent. of the working costs provided the track, equipment, and cars become the property of the Corporation.

PLYMOUTH.

WOMEN AS INSPECTORS.

In answer to a suggestion for the appointment of discharged disabled men to the post of inspectors, instead of women, Plymouth Tramways Committee replied that they had always considered the claims of discharged service men in making appointments, and that they had given employment to over 70 such men. In the present instance, acting under the instructions of the National Service Department, and having regard to the nature of the duties, they were of opinion that women could best fill the position of inspectors.

RHONDDA.

INJUNCTION TO PROTECT TRAMWAYS.

In the Court of Chancery an injunction has been granted to restrain a colliery company from tipping debris on the side of a mountain so as to endanger or threaten, obstruct or injure tramways vested in the plaintiffs, the Rhondda Urban Council, the defendants being declared liable as to any damage.

SCARBOROUGH.

CLAIM AGAINST WAR OFFICE.

The Defence of the Realm Losses Commission is considering a claim by the Scarborough Tramways Company against the War Office. It was alleged that the military authorities by the erection of certain barriers in 1915 cut off a portion of the main route for passengers, and that a loss of £350 in traffic receipts was caused.

SWANSEA.

A ONE-DAY STRIKE.

A strike on the tramways at Swansea on August 22 was terminated the following day by the employees returning to work on the instruction of the national executive of their trade union organisation, pending the arbitration of the Committee on Production on the points in dispute.

WOLVERHAMPTON.

CAREFULLY TRAINED DRIVERS.

Sir Charles Mander, Bart., chairman of the Wolverhampton Tramways Committee, stated recently that in spite of the fact that it had been necessary to train a great number of new drivers the undertaking had been free from any serious accident. He attributed this to the committee's policy of making it imperative for learners to go through the whole of the course necessary for the training of tramway drivers.

YARMOUTH.

STRIKE QUICKLY SETTLED.

On August 17 the employees of the Yarmouth Corporation Tramways ceased work as a protest against their rate of pay. The next day an undertaking was given that the Tramways Committee would at once give sympathetic consideration to the position, provided the employees returned to work. Accordingly the men resumed their duties on August 19. The Tramways Committee then offered an immediate advance of 7s. per week, which was accepted by the employees.

Regulation of Street Railways in U.S.—The United States War Labour Board has asked President Wilson to assume jurisdiction over street railways to the extent of regulating fares. It is stated that the powers of the Executive are sufficiently broad to enable the President to do this. The Labour Board has recommended that wages be increased on all street railways, and if the President approves, the recommendation will become effective.

Digitized by Google

PATENT LIST.

Abstracted for "The Tramway and Railway World" from the Official Journal of Patents.

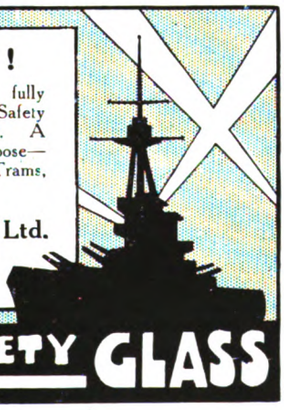
*** If the inventions have been communicated the names of the communicators are given in italics.

APPLICATIONS FOR LETTERS PATENT.

Direction indicators, etc., for motor cars, etc. (12,597)—R. Bowen.
Electro-pneumatic braking systems (12,322)—British Thomson-Houston Company (*General Electric Company*).
Centre rail electric traction (12,670)—G. N. Fell.
Power transmission gear (12,294)—G. R. Inshaw.
Supporting and steering device for front wheels of motor vehicles (12,673)—P. A. C. Larsen.
Means for lubricating shafts or axle journals (12,612)—F. W. Marillier.
Electro-magnetic changing gear (12,315)—Menco-Elma Syndicate.
Variable speed mechanism for motor cars (12,381)—H. W. Pearn.
Apparatus for propulsion of vehicles and prevention of skidding (12,472)—E. Bullock-Webster.
Mechanical feed lubricators (12,856)—Albion Motor Car Company and T. B. Murray.
Variable speed gears and disengaging couplings (12,742)—W. J. Gee.

STEAM AND HYDRAULIC
ENGINE PACKING
MANUFACTURERS
(Flax, Asbestos and Cotton)
And all Engine Room Stores
ATTWATER & SONS
Hopwood Street Mills, PRESTON
Telegraphic Address: "Attwaters, Preston."

STEAM CONDENSING PLANT.
VACUUM PUMPS AND EVAPORATORS.
MIRRLEES WATSON
THE MIRRLEES WATSON CO. LTD., GLASGOW

PROTECTION!
from danger to life and limb is fully secured by the use of "Triplex" Safety Glass. Cannot possibly splinter. A vital necessity for every purpose—Aeroplanes, Automobiles, Ships, Trams, Trains &c.
Catalogue mailed on request.
The Triplex Safety Glass Co. Ltd.
(REGINALD DELPECH, Managing Director)
1 Albemarle St., London W.1.
Contractors to H.M. Government.

TRIPLEX SAFETY GLASS

TROLLEY HEAD SLINGS
Trolley Head Slings 18" long by 3/16" diameter. Best Flexible Steel Wire Rope Galvanised, Loop-spliced in each end to take ½" bolt, and served with Galvanised Wire. Price 12/- per dozen nett (in Gross Lots). Sample on Application.
C. OSBORNE 97 South Street, Longsight, MANCHESTER

Motor vehicles (12,902)—F. J. Osborn.
Secondary electric batteries or accumulators (12,653)—W. E. Spencer and Tudor Accumulator Company.
Electrical signalling apparatus (13,050)—Armstrong, Whitworth and Company, C. B. Chicken and J. H. Shain.
Gear boxes of self-propelled vehicles (13,140)—Caterpillar Tractors, Limited (*Holt Manufacturing Company*).
Cable trackways for railways, tramways, etc. (13,065)—H. H. G. Etcheverry.
Mechanically operated signalling devices (13,033)—A. H. Ford.
Road vehicles (13,152)—J. Liversidge and Son and E. H. Shearing.
Resilient vehicle wheels (13,220)—London General Omnibus Company and G. Rushton.
Method of securing joints of rails (13,320)—W. H. Meek & A. E. Sealy.
Safety guard for front wheels of motor vehicles (13,290)—W. H. Puttergill.
Apparatus for change speed of a motor car (13,297)—S. Tamura and M. Watanabe.
Supporting apparatus for rear axle of motor car (13,290)—S. Tamura and M. Watanabe.
Variable speed gear for motor vehicles (13,362)—H. Taylor.
Current collectors for electrically propelled vehicles (13,105)—R. H. Wilkinson.
Coal gas carburetter for gas-driven motor cars and omnibuses (13,337)—E. J. Buckingham.
Rigid coal-gas container for compressed gas for motor vehicles (13,338)—E. J. Buckingham.
Power transmission gearing (13,237)—J. W. Cann.
Rail fastening (13,447)—R. Askew.
Key and locking device of metal for permanent way of railways, etc. (13,688 and 13,689)—C. J. Budge.
Variable speed gear (13,725)—N. Isherwood.
Variable change speed gear for road and rail vehicles (13,703)—J. Thomas.
Understructure for supporting railway tracks (13,685)—E. Vagneux.

SPECIFICATIONS PUBLISHED.

1917.

Apparatus for warming tramway and railway vehicles (4,794—*117,094*)—J. H. Robinson.
Spring suspension of road vehicles (9,507—*117,115*)—E. W. Bowen.
Electrical systems of power transmission and regenerative braking (13,725—*117,181*)—British Thomson-Houston Company (*General Electric Company*).
Variable speed gearing (15,409—*110,755*)—H. G. C. Fairweather (*A. Leffler*).
Attachment of railway rails to chairs and to tie bars therefor (9,648—*117,288*)—H. Birkbeck and L. Green.
Internal combustion engines for use with automobiles (9,955—*117,295*)—K. J. Smidt.
Gas containers for motor-driven vehicles (13,229—*117,343*)—R. C. Jagger and F. Jagger.
Heavy mechanically propelled road vehicles (13,612—*117,349*)—W. G. Wilson.
Engines for traction on centre rail railways and means of working the same (14,137—*117,354*)—G. N. Fell.
Spring adjuster for motor cars (15,277—*117,367*)—C. E. Cary, A. Dixon, and B. Brayshaw.
Speed indicators (15,451—*117,370*)—F. H. Nalder, Nalder Brothers and Thompson.
Method and apparatus for producing motor fuel oil by distilling petroleum (15,654—*117,372*)—C. B. Forward.
Lighting devices for motor vehicles (17,080—*111,669*)—Benjamin Electric, Limited.
Variable speed gears (685—*117,465*)—H. Biggleston.
Device for guiding the trolley pulley of an electric car into contact with its overhead wire (10,443—*117,498*)—E. B. Moyse.
Rail fastenings (10,762—*117,508*)—Steele Rail Anchor Company and J. R. Steele.
Vacuum brakes for railway vehicles (13,729—*109,973*)—Geb. Hardy.
Motor-driven vehicles (14,259—*117,540*)—F. J. Brougham (*H. C. H. Mustad*).
Regulating systems for motor vehicles (8,516—*107,377*)—T. Douglas.
Braking systems for electrically driven vehicles (9,061—*117,647*)—British Thomson-Houston Company (*General Electric Company*).
Means for actuating signals on and communicating with trains (10,659—*117,669*)—H. A. Thompson.
Electrical point detectors for railways (12,104—*117,712*)—A. E. Hudd and G. H. Wion.
Automobile vehicles (17,384—*117,765*)—E. M. Knolles and J. Cleary.

1918.

Automatically lubricating the rails or the flanges of railway wheels while passing around curves (8,021—*117,246*)—R. H. Nielsen.
Alarm for use in connection with the lubrication of the engines of motor vehicles (2,553—*117,408*)—H. P. C. Lenormand.
Electro-magnetically controlled signal reverser for use on railways (8,290—*117,435*)—Sykes Interlocking Signal Company and R. W. Tarrant.
Axles for motor-driven road vehicles (1,678—*117,777*)—H. M. Butler and C. W. Davis.

Digitized by Google

TRAFFIC RETURNS.

Tramway and Omnibus Undertakings in the United Kingdom.

NAME OF COMPANY OR CORPORATION.	1917. WEEKS ENDED.					1918. WEEKS ENDED.					AGGREGATE.		
	Aug. 4.	Aug. 11.	Aug. 18.	Aug. 25.	Sept. 1.	Aug. 3.	Aug. 10.	Aug. 17.	Aug. 24.	Aug. 31.	Wks.	1918.	Increase or Decrease.
	£	£	£	£	£	£	£	£	£	£		£	£
Aberdare U.D. Council	445	584	476	456	422	505	637	620	526	542	21	10.952	—
Aberdeen Corporation	2.237	2.205	2.323	2 251	2.182	2.848	2.899	3.075	2.804	2.839	13	35.285	+ 6.321
Ayr Corporation	688	724	814	619	535	1.026	943	925	1.008	804	15	9.777	- 3.073
Belfast City	...	...	...	...	...	...	...	...	...	...	...	...	...
Birkenhead Corporation	...	...	1.960	1.824	1.897	...	...	2.406	2.377	2.298	22	48.762	+ 8.442
Blackburn Corporation	1.738	1.641	1.770	1.568	1.391	2.504	2.245	2.172	1.927	1.862	22½	29.252	+ 8.162
Bradford Corporation	7.653	8.608	8.924	8.084	7.446	10.218	11.368	10.802	11.613	9.676	22	202.481	+ 31.788
Burnley Corporation...	1.930	1.934	1.863	1.835	1.750	2.598	2.596	2.483	2.567	2.325	—	—	—
Burton-on-Trent Corporation ...	342	394	334	330	341	472	550	459	454	426	22	9.215	+ 2.493
Bury Corporation	1.720	1.836	2.041	1.806	1.568	2.285	2.381	2.519	2.484	2.060	22	46 418	+ 8.713
Chatham and District	1.359	1.841	1.611	1.507	1.429	1.428	1.729	1.640	1.621	1.527	35	44.883	- 336
Cork Electric	674	679	622	595	577	672	641	704	705	661	35	21.759	+ 2.868
Derby Corporation	1.260	1.562	1.319	1.284	1.251	1.653	1.864	1.630	1.646	1.537	22	33.685	+ 7.050
Dundee City	1.593	1.489	1.497	1.573	1.626	2.055	1.916	2.027	2.032	2.061	15	29.648	+ 6.152
East Ham Corporation	1.437	1.579	1.505	1.579	1.483	1.725	1.860	1.781	2.076	1.601	21½	33.830	+ 2.236
Glasgow Corporation	26.029	26.142	25.902	25.907	26.153	29.368	28.684	28.906	29.119	28.975	13½	377.656	+ 34.390
Glossop (Urban Elec. Supply Co.)...	166	190	176	177	171	190	218	184	216	179	35	6.422	+ 1.243
Halifax Corporation	2.580	2.897	3.418	3.165	2.474	2.835	2.940	4.178	3.941	3.524	21½	61.573	+ 6.174
Halifax Corp. Motor Omnibuses ...	53	54	69	68	51	61	65	107	100	82	21½	1.405	+ 381
Huddersfield Corporation	3.269	3.849	3.784	3.385	3.131	4.333	4.925	4.938	4.537	4.077	22	85.090	+ 10.152
Ilford U.D. Council	791	1.034	868	897	816	1.090	1.312	1.153	953	1.026	22	22.404	- 5.217
Ipswich Corporation	806	1.138	854	874	824	961	1.223	1.049	1.017	932	22	17.876	- 2.477
Isle of Thanet	347	713	574	601	469	604	1.067	919	972	860	48	13.921	- 1.038
Kilmarnock Corporation	184	188	194	195	201	244	243	265	270	274	15½	3.894	+ 855
Lanarkshire	2.865	3.042	2.965	2.963	2.994	3.281	3.778	3.971	3.847	3.856	35	122.643	+ 27.900
Lancashire United	2.627	3.929	...	...	...	3.414	4.314	...	...	...	32	92.052	+ 21.191
Leeds City	10.719	12.579	11.313	11.549	10.770	14.403	16.268	14.856	15.984	13.926	22	291.165	+ 49.293
Leicester Corporation	3.851	4.382	3.743	3.875	3.858	4.919	5.392	4.768	4.956	4.641	—	—	—
Leyton U.D. Council	1.917	2.270	1.981	2.026	1.964	2.600	2.855	2.659	2.747	2.405	22	50.771	+ 7.663
Liverpool Corporation	16.565	18.295	16.658	...	15.884	20.470	22.418	20.017	...	19.051	34½	624.639	+ 91.699
Llandudno and Colwyn Bay ...	628	983	836	835	739	825	1.164	1.027	1.044	951	39	17.518	+ 4.258
London County Council	55.813	61.632	57.630	58.515	57.619	69.479	72.604	69.270	75.370	69.986	21½	1.385.831	+186.955
Maidstone Corporation	239	346	280	277	253	291	394	331	323	306	21½	6.341	+ 906
Manchester Corporation	20.082	22.410	20.699	21.463	20.409	26.401	27.980	26.855	27.942	26.829	22	563.805	+111.306
Newcastle-on-Tyne Corporation ...	7.981	8.423	7.890	8.112	7.866	9.592	9.865	9.560	9.646	9.255	22	201.342	+ 32.176
New St. Helens and District ...	1.568	2.467	...	...	...	2.069	2.855	...	...	...	6	11.273	+ 1.423
Northampton Corporation	858	1.117	852	884	834	865	1.201	921	857	823	22	19.309	+ 1.179
Nottingham Corporation	4.420	5.574	4.551	4.619	4.548	6.131	7.519	5.695	5.703	5.731	22	127.888	+ 32.010
Oldham Corporation	2.972	3.055	2.906	3.286	2.969	3.811	3.971	3.590	4.133	3.542	23	81.341	+ 15.182
Reading Corporation	1.058	1.338	1.126	1.183	1.048	1.423	1.694	1.575	1.500	1.436	21½	29.062	—
Rhondda Tramways	1.545	2.078	1.620	1.544	...	1.878	2.511	1.966	1.901	...	34	58.251	+ 8.616
Rotherham Corporation	1.946	1.931	1.923	1.864	1.837	2.513	2.756	2.677	2.629	2.534	22½	51.686	+ 11.526
Sheffield Corporation	11.717	12.902	12.290	12.468	12.141	13.523	13.884	13.758	14.182	13.430	22½	308.904	+ 37.612
Southampton Corporation	1.975	2.498	2.277	2.294	2.114	2.748	2.958	2.976	2.940	2.839	21½	56.084	+ 12.928
Southend-on-Sea Corporation ...	1.153	2.086	1 858	1.555	1.283	1.736	3.305	2.954	2.747	2.370	22	30.817	+ 7.186
South Shields	...	...	1.032	...	...	...	...	1.294	...	...	20	23.524	+ 4.539
Sunderland Corporation	1.893	2.346	1.924	1.915	1.827	2.216	2.454	2.259	2.264	2.068	22	46.874	+ 6.526
Swindon Corporation	268	337	315	304	272	315	400	377	344	337	21½	6.662	+ 756
Torquay Tramways	805	1.135	1.122	1.076	...	1.252	1.799	1.686	1.629	...	34	30.237	+ 9.479
Tyneside Tramways and Tramroads	918	...	...	...	...	1.247	...	...	...	...	—	—	—
Wallasey Corporation	1.926	2.496	2.003	1.981	1.609	2.504	3.008	2.480	2.470	2.071	21½	44.017	+ 7.349
Walsall Corporation	968	1.437	965	1.055	971	1.261	1.708	1.266	1 363	1.229	22	27.280	+ 5.960
Walthamstow U.D. Council ...	1.215	1.689	1.394	1.467	1.268	1.644	1.914	1.791	1.210	1 489	22	33.006	+ 4.692
Warrington Corporation	540	619	558	562	566	770	835	788	767	766	22	16.140	+ 4.630
West Ham Corporation	3.701	4.178	3.779	3.835	3.778	4.881	5.420	4.939	5.743	4.705	21½	97.560	+ 16.198
Wigan Corporation	1.966	2.426	2.005	1.997	1 992	2.368	2.782	2.495	2.434	2.474	22	50.719	+ 8 211

*** A number of undertakings have suspended the issue of traffic returns for the duration of the war.

Colonial and Foreign Tramway Traffic Returns.

NAME OF COMPANY.	1917. WEEKS ENDED.					1918. WEEKS ENDED.					AGGREGATE.		
	Aug. 4.	Aug. 11.	Aug. 18.	Aug. 25.	Sept. 1.	Aug. 3.	Aug. 10.	Aug. 17.	Aug. 24.	Aug. 31.	Wks.	1918.	Increase or Decrease.
	£	£	£	£	£	£	£	£	£	£		£	£
Anglo-Argentine	52.565	51.017	50.140	49,469	50.116	55.493	58.806	56.706	56.735	53.819	35	1.937.889	+149.121
Calcutta ... . Rs.	69.627	67.333	70.538	69.615	68.468	80.124	80.386	83.180	79.457	78.574	45	2.571.839	+ 22.450
Madras ... ... Rs.	...	(2 weeks)	34.911	...	...	...	(2 weeks)	42.117	...	...	—	—	—
Pernambuco	4.003	3.878	3.938	3.805	4.013	4.082	4.062	4.277	4.164	4.209	35	155.146	+ 24.572

Companies issuing Monthly Statements only.

	1917.						1918.						Wks.	AGGREGATE.	
	March.	April.	May.	June.	July.	Aug.	March.	April.	May.	June.	July.	Aug.		1918.	+ or −.
	£	£	£	£	£	£	£	£	£	£	£	£		£	£
Ballarat & Bendigo	3.329	4,538	2.877	2.811	...	...	3.928	4.094	3.287	3.075	...	...	12	10.456	+ 230
Brazilian Trac. Mlrs	7549000	7453000	7864000	7642000	7.795000	...	8094000	8330000	9030000	9087000	9.465000	...	30	59.158.000	+6.717.000
Brisbane	33.340	31.620	33.340	32.475	32.720	...	35.530	35.530	37.610	36.245	36.360	...	30	247.784	+ 21.469
British Columbia $	456.626	447.429	438.919	373.029	438 378	...	510.892	515.417	486.876	488.873	413.968	...	4	413.968	- 24.410
Buenos Ayres L'c'z.	41.337	39.111	40.595	38.020	38.063	39.111	42.647	41.643	41.315	38.375	41.145	41,817	8	82 963	+ 5.788
Burma	27.132	23.660	24,906	25.463	26.288	...	27.906	27.614	29.019	31.158	34.848	...	52	334 781	+ 23.313
Cape Town	17.688	16,705	...	...	16.067	...	19.911	19.011	...	17.612	18 409	...	—	—	—
Carthagena & H. ...	2.955	4.366	4.321	5,325	5.763	4.164	5.316	4.200	5.027	5.047	5.491	2.729	35	35.852	+ 1.753
Cordoba	...	13.660	13.735	...	...	...	...	14.799	15.649	...	...	...	8	30 448	+ 3 053
East India	1.647	1.445	1.455	1,186	1.183	1.562	1.729	1.791	1.920	1.754	1.968	1.975	4	1.975	+ 413
Kalgoorlie	2.772	2.705	...	...	...	...	2.700	2.876	...	...	...	...	17	10.471	+ 370
La Plata	4.528	4.230	4.127	3.852	3.876	4.075	5.347	5.169	5.105	5.134	6.722	4.382	34	41.315	+ 8.221
Lima	37.586	37.834	35.336	...	...	...	42.106	43.557	42.881	...	...	...	21	213.993	+ 32.168
Manaos ... Rs.	161.156	...	...	...	...	...	157.337	...	...	...	...	...	13	442.799	+ 3,819
Manila ... $	67.140	65.600	61.500	...	...	...	9.700	84.000	93.500	...	...	...	21	367.500	+ 100.060
Monte Video ...	31.979	29.230	28.716	27.458	28.597	...	36.659	33.704	32.301	30.503	31.684	...	39	300.525	+ 29.132
Peruvian ... $	1017000	957.500	902.780	965.420	975.000	979.430	1119530	1079880	1022120	1099470	987.300	1.029610	8	2.016.910	+ 62.480
Port Elizabeth ...	4.428	3.904	3.494	...	3.544	...	4.425	4.028	...	5.404	3.395	...	—	—	—
Rangoon	6.226	5.036	4.737	4.383	4.783	4.788	5.955	5.885	5.719	6.163	6.055	5,760	34	46.560	+ 7.368
Toronto ... $	991.192	970.367	992.460	984.529	954.192	...	1113472	1065766	1090747	1035932	1049.936	...	30	7.406.105	+ 578 329
Winnipeg ... $	293.094	265.594	259.794	254.226	242.797	...	307.289	296.433	280.935	293.140	288.155	...	30	2.099.493	+ 183.326

Digitized by Google

Commercial Reconstruction

A KEY INDUSTRY

IF YOUR BUSINESS embodies transport service the motor lorry is the key to a successful development of your position in the after-war Commercial world. The future position of rail and horsed transport can already be regarded as hopeless for speedy delivery.

The progressive manufacturer and merchant is planning his independent and self-controlled service of motor vehicles, and the performances of present-day vehicles are going to decide his choice.

The

DAIMLER

Vehicles

HAVE SUPERIOR CLAIMS TO YOUR CONSIDERATION

The manufacture of really good Commercial Lorries does not permit of much difference in quality of materials, but design is an open field in which practical experience, brains, and theoretical knowledge have unlimited scope.

Daimler design in Chassis and Engine is unrivalled, and has solved the traction problem. It is entirely different from ordinary practise, and cannot be imitated, being protected by patents.

The Daimler Way is the sure and certain way to profits

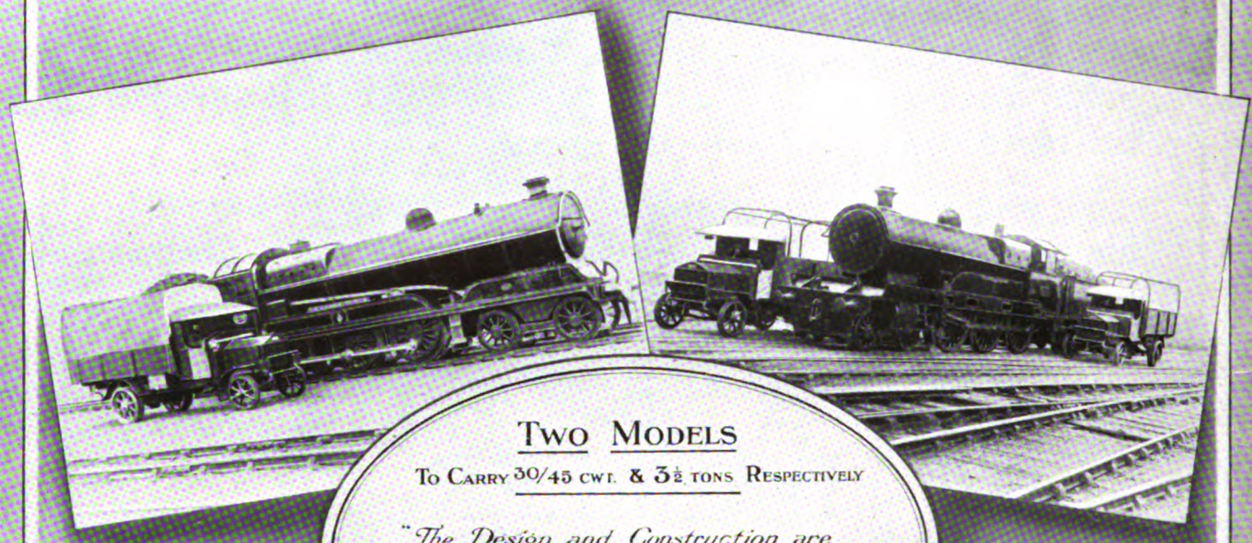
The Daimler Company, Ltd.

Coventry

Digitized by Google

NAPIER

MOTOR VEHICLES.



TWO MODELS

TO CARRY 30/45 CWT. & 3½ TONS RESPECTIVELY

"The Design and Construction are Throughout of a Character, which it would be Exceedingly Difficult, if not Impossible, to Improve Upon."

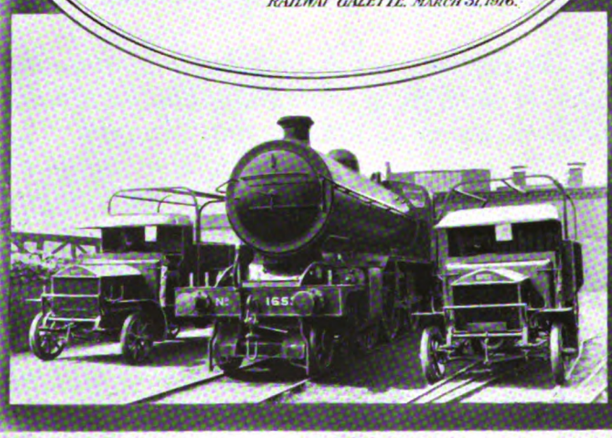
RAILWAY GAZETTE, MARCH 31, 1916.

IN PEACE

USED BY THE LARGEST CARRYING COMPANIES AND COMMERCIAL HOUSES.

IN WAR

USED BY THE BRITISH AND ALLIED GOVERNMENTS.



D·NAPIER & SON LTD

WORKS ACTON, LONDON. W

14, NEW BURLINGTON ST. LONDON. W.

Digitized by Google

THE VEHICLE AND THE ROAD.

We have more than once in this column emphasised that the vehicle and the road are complementary to one another, but that, while there must be some give and take on both sides, it is rather for the road to be fitted to the vehicle than for the vehicle to be fitted to the road. Evidently, provided that we make our roads really suitable for all desirable forms of traffic likely to be of any real utility, it would be unreasonable to allow monstrosities in the way of vehicles to be employed, as likely to result in great damage to the road surfaces or foundations. We ought not, however, to go further in the way of restricting the design of vehicles. We should rather encourage free progress and, when that progress takes place, recognise the fact and improve our roads so as to bring them into line with it. There is an unfortunate tendency in many quarters to consider that the only duty of a road is to be cheap in maintenance and that this object can be best achieved by restricting the traffic that is allowed to use it. If we carry this contention to its logical conclusion, we come to a very simple agreement to the effect that if we allow no traffic on the road at all, the cost of road maintenance will be reduced to a minimum. The trouble is that in that case the road would not be performing the function for which it is created.

* * * * * *

The point of this argument is that it is extremely easy to go too far in the way of dictating the design and load capacity of vehicles simply with the one object of seeing that the types employed do no harm to the roads. It is a pity that we cannot look at the whole question of road transport from a broader point of view. The road and the vehicle taken together are intended to enable us to move goods and passengers from point to point with speed and economy. If we could prepare a full financial statement it would include amongst other things:—

(1) The cost of road construction and maintenance.
(2) The cost of road widenings due to traffic congestion and other causes.
(3) The first cost of the vehicles employed.
(4) The operating costs of the vehicles.

In the result we should be able to assess the total cost of carrying a given load over a given distance. Now it stands to reason that, if we concentrate on only one of these factors, we are liable to be entirely misled. We may, for instance, save the country two million pounds in road maintenance and increase expenditure on the operation of vehicles by five million pounds in consequence. This would be thoroughly unsound, but it is the sort of thing that happens if the regulations as to the use of vehicles are framed only or mainly by those who are simply concerned with the maintenance of roads and the provision of money therefor.

* * * * * *

The directions in which those who are particularly interested in roads and their cost are liable to interfere unduly with the development of road vehicles are mainly in respect of their useful load capacity and such features of design as wheel-base. It is considered that vehicles of very short wheel-base are injurious to the road surface. Consequently, we find regulations proposed which would have the effect either of reducing the useful load carried by a vehicle of given dimensions, or alternatively of necessitating an enormously long wheel-base, making the vehicle far from handy in traffic or upon sharp bends. Excessive wheel-base would be absolutely fatal to the success of a vehicle under most conditions in the Empire overseas. Consequently, if this feature is necessitated at home, it would be necessary for manufacturers to divide up their output, producing special models for export. This is the direct opposite to the system of quantity production of a single type which we know makes for economy in works. Moreover, the very long wheel-base makes a vehicle extremely difficult to manœuvre in confined spaces and somewhat dangerous in traffic owing to its inability to turn sharply enough to keep on its proper side of the road. It may, of course, be argued that no one is compelled to adopt a specially long wheel-base, but as a matter of fact the only alternative opened by those who are simply considering the interests of the roads, entails a material reduction in the useful load carried. This in turn obviously means a considerable increase in the cost of operation per ton-mile. Motor users generally cannot afford to allow restrictions to be introduced which will either put up the cost of transport or make motor vehicles materially less efficient and handy than they have been in the past. We must, even at the cost of increasing road maintenance charges, secure the best all-round efficiency of our transport system, and this certainly cannot be done by introducing arbitrary restrictions which will interfere with the natural developments in design.

Digitized by Google

MOTOR TRAFFIC.

THE GOVERNMENT MOTOR REPAIR DEPOT.

The scheme for the erection and equipment of a Government motor repair depot at Slough has now received approval, subject to the qualification that the work should be proceeded with in sections and the scheme kept down to the lowest possible dimensions. It is only under such conditions that the scheme can be justified at all, and we hope that the fact of a general approval having been given to its main principles will not operate so as to permit enthusiasts to extend it beyond its legitimate scope for purposes which would never have been regarded as sufficiently important to justify its acceptance in the first instance. The depot is required only for repairs and not for manufacture. There is certainly no intention of using it for the latter purpose for the present, but the day may come when some such proposal may be put forward. We certainly do not want a national motor factory designed to fill the needs or part of the needs of our armies after the war. Anything of the kind would be very undesirable for many good reasons. The first of these is that our organisation for the provision of military lorries and other war vehicles needs to be extremely flexible. The normal peace establishment is trifling as compared with the fleets required during a great war. The increase in supplies must be able to keep pace with the most rapid mobilisation imaginable. This requirement can only be fulfilled if the military types are in peace time produced in comparatively small numbers from a quantity of factories, representing in each case only a trifling fraction of the whole output. In the event of war breaking out, the works can then be turned over rapidly to an increased output of military types. If, on the other hand, the War Office depended in peace time upon its own factory, then no other manufacturing concerns would be equipped for the production of military models, or would have been encouraged to standardise types of vehicle suitable for military use. For this reason, manufacture must be left in the hands of the home industry and it would be most detrimental if the Government interfered with it.

* * * * * *

The above argument applies only to a possible contingency in connection with the Slough scheme. Considering its more immediate purpose, we are informed that to equip the depot for repair work upon an adequate scale will involve a total expenditure of something over a million pounds. The Committee charged with the duty of considering whether such an expenditure can be justified, advise, as already stated, that the depot should be constructed in sections and that meanwhile everything possible should be done to secure the repair of an increased number of vehicles by their own manufacturers. So far as the British vehicles are concerned, we see no particular reason why this latter method should not be generally adopted to fill all the needs. The expenditure necessary to put manufacturers into a position to repair their own vehicles at the required rate would be infinitely less than that involved in the construction of a brand new depot on a huge scale. It would, moreover, have the advantage of bringing results with much less loss of time. Furthermore, it would bring about a state of affairs under which, at the conclusion of the war, every manufacturer would be able to take over the returned vehicles of his own make and deal with them quickly and well. It may be argued that this same work could be done also in a Government depot, but the work of overhauling is not all that is required. The returned vehicles must first be put into condition and afterwards sold. The manufacturer has his selling organisation, but the Government depot will have none. Furthermore, the manufacturer, if he repaired his vehicles, would give them his own guarantee of condition and would obtain thereby better prices than would otherwise be got. The fact of the matter appears to be that the Slough depot is really necessary only for the repair of foreign vehicles owned by the British Government and it ought to be kept down strictly to the size required for that purpose.

* * * * * *

Some people regard the Slough scheme as being really at bottom an attempt to provide a permanent home for the A.S.C., M.T. If that be its direct object, one may admit at once that it is a desirable one, but at the same time one cannot fail to notice that it represents an unduly expensive way of attaining the desired end. When the war is ended there will be large numbers of big national munition factories standing idle. One or more of these situated in suitable centres, could be taken over. It is quite possible that it would be better to have a number of depots in various centres than to concentrate upon one central depot. One reason for this would be that, if any form of subvention scheme is continued, it would be a good thing for each locality to have its own depot from which inspections would be carried out and at which machines could be collected and mobilised in emergency. Altogether the Slough proposition, though unfortunately necessary as a war measure, provided that its scale is kept down to the minimum, is one which, unless strict moderation is observed, may have a very serious detrimental effect on the future of the motor industry and consequently upon the supply of vehicles required by motor users.

SAFETY HINTS FOR GAS MOTOR DRIVERS.

The London Safety First Council have issued an illustrated poster giving hints to drivers of gas-propelled vehicles with a view to the prevention of accidents. The importance of this action will be appreciated when it is considered that in the United Kingdom there are 8,000 of these vehicles, of which number 4,000 are running in the metropolitan district. The wording of the poster is as subjoined :—

Stop the engine and apply brakes before attempting to charge container.

Turn off petrol supply cock securely before turning on gas supply, or excessive " back-firing " may result, thus frightening horses and alarming pedestrians.

See that flexible pipes are not twisted or kinked, or unnecessary wear and leakage may be caused. The supply pipe to engine should not protrude beyond the body line or rub against wind screen.

Don't enter any building without first observing the head room ; the container may get torn and cause leakage of gas and explosion in the building.

The container should never sag over the side of the vehicle. Empty tins or packages carried on the container are liable to cause injury and leakage.

Above all, avoid bringing any kind of naked light close to a gas-propelled vehicle or inside a garage. Keep garage ventilators open—always !

Rubber or composition pipes ought not to be close to heated surfaces. Metal connections are safer and better.

The anchoring of the container to the vehicle should be well designed and kept secure.

When approaching overhanging trees, low bridges, projecting signs, shop awnings, telegraph poles, lamp standards, aerial wires, etc., take care !

Digitized by Google

MOTOR TRAFFIC.

THE GREAT MOTOR DEPOT AT SLOUGH.

War Office Scheme Approved.

The eighth report of the Select Committee of the House of Commons on National Expenditure, which was issued last month, contains among other things the following in reference to the proposed military motor transport depot at Slough.

Our Sub-Committee have made close inquiry into the necessity for the depot which it is proposed to establish at Slough as a motor transport warehouse and repair workshop, at a cost of somewhat over a million pounds. This depot is intended for the use of the War Office and of the Air Force, and to meet the needs of the present time, of the period of demobilisation, and of after-war conditions.

The case for the establishment of a great central depot is as follows:—There is now in England an accumulation of several thousand motor vehicles awaiting repair, three times as many as a year ago. In France there are almost an equal number. They represent some millions of pounds' worth of plant lying idle. As the average age of the vehicles in use increases the proportion needing repair increases. The lorries and cars now in use should be overhauled periodically; the absence of facilities for doing this involves wasteful running, especially an excessive consumption of petrol, and it shortens the life of the vehicles. The spare parts now in Government stores are valued at £5,250,000, in addition to £1,500,000 at the makers; they number 200,000 different items. The existing scattered workshops and warehouses, often in unsuitable premises, are quite inadequate for present needs, and involve a waste of money, of labour, of transport, and of time. On the termination of the war there will be a mass of lorries, cars, cycles, spare parts, and machinery to be brought back from France, representing a value of many millions. It will take two or three years to put the vehicles into good order and to dispose of them. If they are not properly dealt with there will be heavy loss through deterioration. After the transitional period a central motor transport depot will be needed by the post-war Army and Air Force.

Our Sub-Committee have considered possible alternatives to this costly scheme. They have inquired into the practicability of less expensive arrangements being made in France, or in England, or both, to meet the present needs, with the expectation that when the war is over the Ministry of Munitions may have national factories idle, one or more of which might be devoted to this purpose. They have considered also whether adequate arrangements might not be made with the manufacturers to repair the vehicles of their own make. But for various reasons, into which it is not necessary to enter in detail, they are convinced that there is no satisfactory alternative to the establishment of a central depot. They have ascertained that the opinions of a number of experts, unconnected with the War Office or with the army, were invited before the scheme was adopted, and that they were unanimous as to its necessity. The Surveyor-General of Supply, Mr. Andrew Weir, fully endorses it.

It appears therefore that the case for the depot has been fully made out. Indeed, the criticism that may properly be made is that much waste would have been avoided had the repair workshop been established long ago. Owing to the absence of facilities for repairs, both in the manufacturers' and in Government workshops, the consequence has ensued, involving great extravagance both in money, in labour, and in material, of new lorries and cars being manufactured and brought into use, while serviceable vehicles, needing only a fraction of the labour to be put into order, are standing idle in thousands. Major-General Crofton-Atkins, the Director of Supplies and Transport at the War Office, is to be commended for the foresight and persistency with which, during a considerable period, he has endeavoured to press forward this proposal.

It is not within our province to consider how far objection was properly raised to the site selected on the ground of the injury done to food production. The evidence received by our Sub-Committee indicates that the site is not unsuitable for a depot such as is proposed.

There remains the question of the scale on which the depot is to be built. As to this we think it advisable that the War Office should proceed with caution. It will be some months before any important section can be brought into use. If the end of the war appeared to be in sight, the situation would be completely altered; for although the depot, once in being, could be put to excellent use during the period of demobilisation, and possibly afterwards, we should not have endorsed the proposal on account of post-war considerations alone. It would no doubt be possible after the war to find, if necessary, some national establishment, thrown out of use by the ending of hostilities, which could be devoted to the purposes in view during the period of demobilisation, and no one can now foresee what will be the scale of the army and of its motor transport under peace conditions.

It may be practicable also to make greater use than is now the case of the manufacturers' establishments for the repair of the vehicles which are of British make and of recent type. Although it is clear that private firms are far from being able to cope with the whole situation, an endeavour should be made to secure that a larger proportion of their resources should at once be devoted to repairs and a somewhat less proportion to manufacturing. Their establishments being controlled, the Ministry of Munitions should be in a position to effect this.

It is desirable, and our Sub-Committee understand it is now contemplated, to build the depot in sections, concentrating the available labour and material on the completion of each in turn. The Army Council should, in our opinion, keep a careful watch upon this important undertaking, with a view to restricting its scale to more modest dimensions if any change of circumstances renders a smaller establishment sufficient for the immediate necessities of the case. It ought not to be completed, in our opinion, in accordance with the present very extensive plans for the sake of post-war conditions alone.

A ROAD-WASHING VEHICLE.

The accompanying illustration depicts the latest development representing the collective experience of several years' work in the endeavour to do away with dust-raising revolving road brushes, and substituting the cheaper and more efficient method of washing and cleaning by water.

One of the main points of this machine is that it covers a wide spread of road both by water and squeegee, and this has been carried out by arranging three power-spray water nozzles instead of two as in earlier patterns. This makes it possible to cover 40 miles

Straker-Squire Road Washing Vehicle.

of roadway during a night's washing, and a similar or even larger mileage during the day on flushing work.

With all three nozzles going, two miles of washing are accomplished on a 1,100 gallon filling of the water tank. Needless to say that in changeable weather, such as is the average in England, there is no necessity for using the whole of the three nozzles, and in wet weather they can be partially closed, thus halving the quantity of water used. On macadam roads, where the power-spray is impossible, and only gravity sprinkling admissible, the filling of the tank would practically last double the time.

These few indications will make it possible for anyone to compare the large saving this last product of the Straker-Squire works represents as against the old methods of road brushing with everlasting refills of brooms.

Motor Cab Mileage per Gallon.—In the London Sheriff's Court, a motor cab owner said his cab earned £1 a day net, and he was proud to say that it traversed 25 miles to the gallon in London traffic.

Digitized by Google

MOTOR TRAFFIC.

A SOUTH AMERICAN MOTOR MARKET.

After-war Prospects for British Manufacturers in Argentina.

"Argentina: A Market for Motors," is the subject of an interesting and informing article in "Argentina Commercially Considered,"* in the course of which the writer expresses the belief that after the war Argentina will develop into the largest market for motor vehicles in South America, and one of the largest in the world. The demand for motor vehicles will, it is anticipated, increase far above the present level, and above that of pre-war days.

The market in cars proper may be divided into three classes: the car *de luxe*, the touring car, and the small car. The first is now well known in the big cities, and its uses are for promenades and functions. The touring car is wanted by those who have to journey between town and country, or from railhead or station to the more remote districts. The small car or runabout is wanted both in town by professional men and on the estancias, for speedily getting from point to point. The requirements of the car *de luxe* in no way differ from the requirements for similar cars in Europe. The touring cars which will be a success are those which can stand hard wear and tear, and in the machinery of which the fewest complications can arise. It is pointed out that the roads outside the towns are not good, a fact which has militated against automobiling in the past. They are narrow; in dry weather very dusty, and in wet weather very muddy. They are, especially off the main routes, badly mauled by wagon tracks. It will be obvious that cars should therefore be strongly built, well springed, and with good clearance—with extra good clearance in fact. The colonial model is therefore well suited to the country. As regards upholstery, particular attention should be paid to dustproof and waterproof requirements.

The light car that will stand service on the estancia is wanted literally for "knocking about." As often as not it will have no garage, and it will be one of the lucky ones if it gets a shed to cover it. It will stand in pouring rain and broiling sun for weeks and months. If it gets washed, it will be a rarity indeed. If damaged, it will be repaired on the kill or cure system, and the odds will be even as to which will supervene. It will be driven across fields and ditches for more miles than ever it will travel on roads. It may, and probably will, be used as an auxiliary to round up cattle, and possibly, on emergency, even to drive a dynamo. The car must therefore be very hardy, very simple, and on account of its comparatively short life, cheap, with high clearance and moderate turning radius. Speedometers should register kilometres, and the tread 4 ft. 8 in. Tires in metric sizes, enclosed valves, and leather clutch are advisable features. Hitherto the market whence cars *de luxe* have been imported has been Europe, and indeed, until a few years ago, practically all the cars in the Argentine were European. About 1912, American cars put in an appearance, and at the present time all imports are from the United States.

The British manufacturer has now to show that he can produce and lay down at the estancia a car as practical, as lasting, and as cheap as the American. He can do it, but he has now, or as soon as circumstances permit, to get out in Argentina and demonstrate it. A beautiful salesroom in Buenos Aires and a trial run round Palermo are sufficient for showing off a landaulette or other car *de luxe*, but not for proving that a car is *the* one to take the client from, say, Buenos Aires to Rosario, or in which to race about an estancia of 50,000 acres in Santa Fé, or to travel 150 miles over the undulating tracks of Pampa Central.

The use of the motor truck is, it is stated, quite inconsiderable, though with proper demonstration of the right vehicle there is an extensive field to be opened. The objections to the motor truck in the cities are mainly due to the narrowness of the streets. A motor truck is not a great advantage where traffic all moves in one direction, and its speed may be dominated by the celerity of a vegetable cart with an aged moke between the shafts. Still, in such places as Buenos Aires, Rosario, La Plata, and Bahia Blanca, there is a certain demand to be met.

One has only to remember the character of Argentine exports—grain, wool, hides, timber, dairy produce—to realise the enormous possibilities of motor lorries amongst the estancieros. Everything exported from Argentina has to be brought many miles across country to the railway or the river, and this is done principally by horse traction. The use of the lorry means larger loads, quicker journeys, and fewer hands. Its advantages are already beginning to be recognised, but the lack of trained mechanics and the high cost of fuel have hitherto militated against their success. The opening up of the oil fields at Comodoro Rivadavia and elsewhere are solving the latter difficulty. The former will be solved when the demand for trained labour justifies the organisation of supply. (The remarks with regard to motor trucks are equally applicable to steam transport.) As in the case of cars, trucks will have to be of strong and simple make, able to carry out a lot of hard work under difficult circumstances and without protest. The record of the motor transport in the war shows what can be done. In Argentina there is the field; with proper salesmanship there is the demand, and the M.T.C. is proof sufficient that British manufacturers can effectively supply it.

With regard to motor farm tractors, the writer in "Argentina Commercially Considered," quotes Mr. David Beecroft, the special agent of the Bureau of Commerce, Washington, B.C., who was sent to Argentina to investigate the opportunities, as saying:—"No country is better adapted to the use of the motor farm tractor than Argentina, with its long level stretches, its entire freedom from stones, and its sparse farm population. The farm tractor was introduced by American manufacturers on the pampas several years ago, but unfortunately its application was not the greatest success. Seven or eight years ago mechanical farm help competent to care for the farm tractor was not to be had, and the machines proved a failure, not owing to a faulty design, manufacture, or materials, but owing to lack of competent operators. Those tractors were largely of the heavy type, capable of pulling 8 to 12 ploughs. They are still to be seen, but are not in use because of the high cost of fuel and the problem of operators. Unfortunately they are not a good advertisement for the American tractor industry of to-day. To-day the estanciero is not favourably disposed to the farm tractor, partly because of past experiences, but largely owing to the high price of gasoline, the cheapness of horses, and the poor crops of the last two years. The small American gasoline tractor, capable of pulling three or four ploughs, is on the Argentine market, but is not selling. In spite of the handicaps the estanciero is looking more favourably on the small tractor. He sees in it a cultivating capacity that will make up to some extent for the shortage of labour due to the cutting off of immigration since the war and the emigration of many Italian farm labourers who have left to join the colours of their native land."

The imports of cars into Argentina of recent years are stated to have been:—

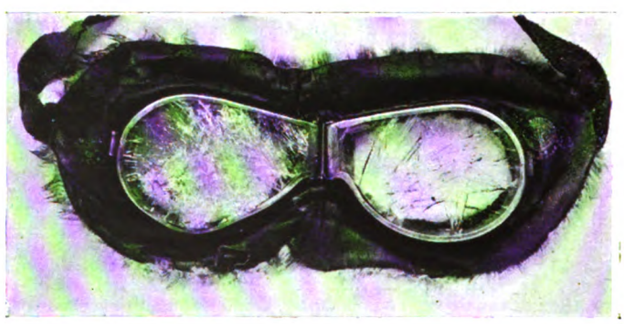
Year.	No.	Customs Value. £	Average Value. £
1911	2,461	469,317	190
1912	4,281	1,031,806	247
1913	5,115	1,038,843	205
1914	2,185	221,133	101
1915	1,847	121,991	67
1916	5,929	439,117	74

Exporters are reminded that advertising and all literature and correspondence should be in Spanish, and prices should be quoted f.o.b. But the best method of doing business is by means of competent demonstrations worked in conjunction with responsible agents, a concessionaire house in Buenos Aires or Rosario, which will have its own branches or sub-agents in other places.

* "Syren and Shipping" Offices, 91, Leadenhall Street, London, E.C.

TRIPLEX SAFETY GLASS.

The appended photograph strikingly illustrates the invaluable service often rendered by Triplex safety glass. This pair of goggles



without doubt saved the sight of an airman who crashed when wearing them. As will be seen, the glass completely withstood the very severe test. The wearer states that his experience enabled him to realise the indispensability of Triplex safety glass.

Digitized by Google

MOTOR TRAFFIC.

GOVERNMENT ROAD CONTROL.

In reply to a resolution passed by the Executive Committee of the County Councils Association, requesting an assurance that all highways taken over under Regulation 5 of the Defence of the Realm Regulations will be handed back to the highway authorities in a proper state of repair, or that they will be paid the full cost of all necessary reinstatement, the War Office Controller of Roads and Bridges has written :—

"The whole question of the state of repair or necessity for reinstatement of any roads which may have been taken over under the authority of Regulation 5A of the Defence of the Realm Regulations will be dealt with at the time such roads are returned to the local authority responsible for them. Your association can rest assured that all equitable adjustments on the lines indicated will be made." The Controller of Munitions Finance, Ministry of Munitions, wrote :—

"The Minister will see that when roads are returned to them the local authorities are equitably treated."

ARMY CONTROLLER OF ROADS AND BRIDGES.

At a meeting of the County Surveyors' Society a resolution was passed expressing a hope that the Army Council Order of March 15, 1918, appointing a Controller of Roads and Bridges, will be modified so as to provide that the suggested control shall relate to traffic only, and that the title of the officers appointed to control such traffic be amended accordingly. The meeting also hoped that the Army Council will not authorise any modifications of the statutory duties, powers, and obligations of highway authorities (other than in cases of neglect to maintain highways such as those contemplated by the Order in Council of February 5, 1918) ; that the form of procedure with respect to the execution of road works in connection with requisitions by the Board of Trade (Timber Supply) and the Ministry of Munitions and other Government departments, be adhered to ; and that the work be carried out through the Road Board as heretofore.

PROTEST BY THE MUNICIPAL ENGINEERS.

At the August meeting of the Council of the Institution of Municipal Engineers the following resolutions were adopted :—

"That the secretary send the following protest to the Road Board or other proper authority :—This institution views with alarm the growth of a military control of the highways of the country, as such a control is not, in their opinion, to the best interests of the ratepayers or municipal engineers, who have had the control of the highways hitherto, and the institution strongly protests against such a control being set up ; " and

"That the secretary communicate with the Transport Board and ask for this institution—as representing municipal engineers—to be represented on the Transport Boards now being formed all over the country, so that its members may be kept in touch with all questions of transport affecting roads and traffic thereon."

A REPRESENTATIVE ROADS COMMITTEE TO BE FORMED.

Replying to a question in the House of Lords by Lord Montagu, Earl Stanhope remarked that there had been a good deal of misunderstanding on the subject of military control of roads. Many Government establishments had sprung up all over the country ; some near main roads and others near roads that were not fit for traffic. It was obvious that the damage would be very considerable, and that the cost of repairs was not a fair charge on the local ratepayers. A directorate of the War Office was made responsible, and the Road Board was asked to become its agent in settling these questions with the local authorities. Subsequently the Ministry of Munitions and the Air Force made use of this department to deal with roads with which they were concerned. Apart from actual damage there were side roads that needed widening to connect them up with the main roads. With regard to damage the Government took responsibility under certain conditions. He hoped that eventually the control would go back to the local authorities. It was hoped that there was now a scheme which would do away with friction. The idea was that there should be set up a Joint Roads Committee on which the Road Board, local authorities, and Government departments concerned would be represented.

MOTOR OMNIBUSES FOR TODMORDEN.—Application has been made by Todmorden Corporation to the Ministry of Munitions for a priority certificate to enable the engineer to purchase three new motor omnibuses. In view of the fact that a number of vehicles have been commandeered only a restricted service has been possible. This has been quite inadequate for the needs of the town, and as a result of strong local feeling a deputation will wait upon the officials of the Ministry to urge the importance of the matter, should this prove necessary.

EUROPEAN MOTOR CAR CENSUS.

The Press Bureau of the Fiat Motor Works, Italy, has issued the following statistics showing number of motor cars in use in Europe—

	No. of Cars.	Year.	Population.	No. of Inhabitants per Car.
Great Britain	171,607	1917	46,087,000	268
Germany	95,000	1914	65,000,000	684
France	98,400	1916	39,600,000	402
Italy	35,500	1918	35,587,784	1,002
Russia	27,900	1916	148,289,000	531
Austria-Hungary	19,360	1916	52,608,000	2,671
Belgium	14,700	1916	7,580,000	515
Spain	10,253	1918	20,400,000	1,989
Holland	10,000	1917	6,583,226	658
Sweden	9,000	1916	5,638,500	626
Denmark	8,500	1917	2,919,000	343
Switzerland	6,157	1914	3,765,000	611
Portugal	3,211	1917	5,433,000	1,692
Norway	3,067	1918	2,240,000	730
Bulgaria	3,050	1916	4,330,000	1,419
Roumania	2,500	1913	7,248,061	2,899
Finland	2,000	1917	3,600,000	1,800
Greece	800	1917	3,912,000	4,890
Turkey	500	1913	—	—
Monaco	230	1916	22,000	95
Serbia	200	1914	4,490,000	22,450
Malta	100	1917	224,000	2,240
Gibraltar	45	1917	18,500	411
Cyprus	15	1917	273,867	18,257
Rhodes Islands	14	1917	30,000	2,142
Crete	3	1917	365,000	121,665

In most instances the figures do not include lorries and motor cycles. This is also the case with Great Britain, where many thousands of lorries, cars, and cycles have been added for the purpose of the war. The 1917 returns for Great Britain are lower in respect of cars than was the case in 1914, the reason being that many private cars have been withdrawn from use. In the case of Malta the number of cars has increased from barely half a dozen in 1914 to 100. This is due to the island having been made a base for hospital and other purposes during the Gallipoli campaign, when more than 90,000 wounded and sick soldiers and sailors were received in hospital.

A NAPIER LORRY IN RAILWAY SERVICE.

The Napier lorry shown in the accompanying illustration was converted into a staff rail car by one of the A.S.C. workshop companies in German East Africa. The body, hood, wind screen, and luggage carrier are made of parts salved from the scrap-heap. The

vehicle is fitted with German railway wheels adapted to the Napier chassis, the body is made from a car which had been damaged by shell fire, and the luggage box at the rear is made of native wood fitted together on the spot. The chassis is of the 30-45 cwt. type, and since it has been fitted and used by the staff it has proved its reliability by freedom from breakdown.

ANNUAL MEETING OF THE MUNICIPAL TRAMWAYS ASSOCIATION.—As previously announced, the annual meeting of the Municipal Tramways Association will be held at Leicester on September 26 and 27. The programme of the meeting was not completed when these pages went to press.

Digitized by Google

MOTOR TRAFFIC.

THE ECONOMY OF ELECTRIC VEHICLES.

CHESTER'S ELECTRIC WAGONS.

Since June and September, 1916, two battery tipping wagons supplied by Edison Accumulators, Limited, have been engaged in collecting house refuse at Chester. Mr. S. E. Britton, the city electrical engineer, has reported that at the end of December, 1917, the wagons had travelled 13,688 miles, collected and carried 5,974 tons of house refuse, delivered 217 tons of fuel to the electricity works, and conveyed 167 tons of shell and 256 tons of scrap steel to the railway station. The working expenses were :—

	Per mile. d.	Total. £ s. d.
Drivers' wages	4·50	256 13 0
Repairs	0·24	13 13 9
Materials	0·60	34 4 0
Insurance	0·20	11 8 1
Electrical energy	2·65	151 3 2
Maintenance of tyres	1·00	57 0 8
	9·19	524 2 8

A sum of £48 2s. was received for the cartage of fuel, shell, and scrap steel, making the net cost of carting refuse, excluding interest and depreciation, £476 0s. 8d.

The two vehicles do the work of six horses, carts, and men. These, if obtainable, would have cost for hiring, £1,516 14s. The drivers employed with the horses and carts also assist in filling the latter, so that in order to get a fair comparison their wages should be deducted from the cost of hiring. Each man devotes approximately two-thirds of the day to driving from house to house and collecting, and one-third driving to and from the tip. For the purpose of comparison the drivers' wages are allocated in equal amounts to collecting and driving, which reduces the hiring figure by £256 16s., making the figures for comparison :—

	£ s. d.
Six horses and carts	1,259 18 0
Two electric vehicles	471 3 0
Leaving a balance in favour of the "electrics" of	788 15 0

For repayment of loan and of interest, £733 was allocated in the period stated.

ELECTRIC VEHICLES AT GLASGOW.

In the report of Mr. W. Greig, the cleansing superintendent to Glasgow Corporation, for the year ended May 31, 1918, it is stated that the two Edison accumulator 2-ton vehicles which were put into service in December, 1916, and May, 1917, respectively, have proved very satisfactory, being efficient, dependable, economical, and easily driven. An order for two additional machines of a similar type was placed some time ago, and it is hoped that delivery may be obtained in the near future. Compared with horse haulage, the figures for the past year are as under :—

For electric vehicles ... ... 3s. 5½d. per ton.
For horse traction ... ... 4s. 1¼d. per ton.

On August 9, 1918, the Cleansing Committee agreed to recommend the Corporation to purchase two 2-ton battery wagons at £1,168 each, and two 3½-ton battery wagons at £1,432 each.

Twelve petrol-driven street sweeping machines were at work during the year, the cost being 5½d. per 1,000 sq. yds. swept, as against 5¾d. for horse-drawn sweepers. Great difficulty was experienced in securing the material required to keep the machines in repair, and drivers and mechanics were difficult to obtain.

Owing to the afore-mentioned difficulties the cost of working of two petrol-driven wagons, each of 3-ton capacity, was unduly high during the year. Another cause which helped to inflate the cost was the numerous stoppages during the process of collecting domestic refuse. Mr. Greig again mentions, however, that the wagons have a great advantage in the rapidity with which they convey the refuse to the destructor works. The cost per ton came out at 4s. 6½d., as against 4s. 1¼d. per ton for horse traction.

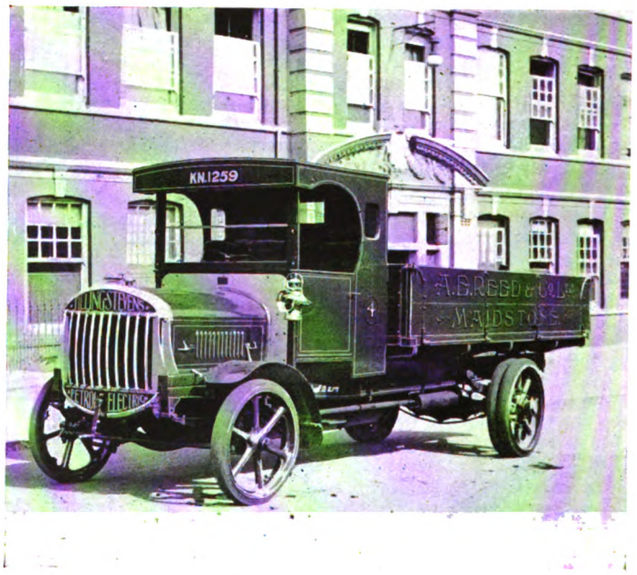
NUMBER OF MOTOR HIRERS IN THE UNITED KINGDOM.—The motor hirers' section of the Motor Trade Association reports that there are 7,475 motor hirers in the country, of whom 2,623 are members of the section. In view of the excellent services which the section has rendered to its members, the committee consider that it should be a comparatively easy task to induce the remaining 4,852 hirers to become members.

TILLING-STEVENS VEHICLES.

The four-ton flour van illustrated below has recently been delivered to Messrs. J. Draper and Sons, of St. Leonards-on-Sea, by Messrs. Tilling-Stevens, Limited, of Maidstone. The makers

were successful in obtaining the necessary priority and permit specification to enable delivery to be made.

A 4-ton lorry supplied to Messrs. A. E. Reed and Company, who are paper manufacturers, is shown below. This vehicle is also operated on the Tilling-Stevens petrol-electric system, with their indirect electric drive, driven by an electric generating plant consisting of a 40-H.P. engine coupled to a dynamo supplying electrical



energy to a motor, which in turn drives the back axle. Similar vehicles have been supplied, as is well known, to all the leading Corporations and omnibus companies, and to a great many of the haulage companies, as well as to several private users.

A NEW CHANGE-SPEED GEAR.—A new type of change-speed gear has recently been patented by Leyland Motors, Ltd., and Mr. J. G. P. Thomas. It is a novel departure from the usual practice, and is similar in principle to a differential gear. Five forward speeds and a reverse are provided, and the whole arrangement is of a most simple character.

Digitized by Google

MOTOR TRAFFIC.

MOTOR VAN WITH SLEEPING BERTH.

The development of long-distance goods traffic by motor vans in the United States, in order to relieve the congestion of the railways entailed by the war, has led to the introduction of bodies with

Motor Van with Sleeping Berth.

closed fronts. Another useful feature is the addition of a sleeping berth for the use of the men in charge, as shown in the illustration.

HIGH PRICES OF SECOND-HAND MOTORS.

NEW ELECTRIC VEHICLE AS AN ALTERNATIVE.

In an endeavour to obtain a vehicle suitable for conveyance of coal to the electricity works, the electrical engineer to Ilford Council has inspected a number of second-hand steam and petrol machines. The prices were as follow :—

Second-hand steam wagons—"Clayton," 5-ton, 1913, rubber tires, flat platform body, £950 ; "Sentinel," 3-ton, new rubber tires, flat platform body, £650.

Second-hand petrol lorries—"Straker," 3-ton, 30 H.P., £325 ; "Commer," 2-ton, 22 H.P., £400 ; "Commer," 4-ton, 22 H.P., £450.

As no second-hand electric wagons were obtainable, the engineer had obtained prices for new vehicles, as appended :—

General Vehicle Company, Limited—3½-ton chassis, £1,085 ; hand-tipped body, £195-£1,280 ; electric tipped body, plus £57-£1,337. If fitted with Wilkins' unloading gear the price will be rather less than electric.

Mossay and Company, Limited—3½-ton "Orwell," chassis, £987 ; hand-tipped body, £135-£1,122 ; electric tipped body, plus £50-£1,172. Two-ton "Orwell," chassis £842 ; hand-tipped body, £120-962 ; electric tipped body, plus £45-£1,007.

Electromobile (Leeds), Limited—3½-ton, 4 motor drive, hand-tipped or Wilkins unloading gear, £1,200.

Edison Accumulators, Limited—2-ton chassis, £1,068. Unable to quote for body.

Delivery was promised by the General Vehicle Company in 8-10 weeks after receipt of permit ; the other electric vehicle offers being three to four months.

Owing to the high prices asked for second-hand vehicles, the engineer advised the purchase of another electric wagon, as the slightly increased cost would be compensated for by the decreased running cost. He advised the acceptance of the offer of the 3½-ton "Orwell," but substituting the Wilkins unloading gear for the electric tipping body on the ground that it has several advantages over the ordinary tipping gear.

MOTOR VEHICLES FOR MUNICIPALITIES.

ERITH URBAN COUNCIL are obtaining estimates for a motor ambulance.

BURY ST. EDMUNDS GUARDIANS have under consideration the purchase of a motor fire engine.

BIRMINGHAM CITY COUNCIL have been recommended to purchase two motor vehicles at a cost of £350.

KNARESBOROUGH RURAL COUNCIL are considering the purchase of a traction engine and three wagons.

CUPAR CORPORATION have decided to purchase a motor tractor suitable for the haulage of the fire engine.

MAIDSTONE TOWN COUNCIL propose to borrow £1,200 for the purchase of a 3½-ton electric tipping wagon.

OSSETT URBAN DISTRICT COUNCIL contemplate the purchase of a steam wagon for the Highways Department.

PONTYPOOL URBAN COUNCIL are contemplating the purchase of a motor lorry for the collection of house refuse.

STIRLINGSHIRE COUNTY COUNCIL have decided to purchase a steam tractor for use in the highways department.

SOUTHGATE URBAN COUNCIL have accepted the tender of Messrs. Aveling and Porter for a steam wagon to cost £1,163.

BURNLEY CORPORATION have under consideration the purchase of an electric vehicle for use in the electricity department.

GLOUCESTER TOWN COUNCIL have been recommended to purchase an electrically-propelled hauling lorry at an estimated cost of £1,200.

SHEFFIELD CORPORATION have authorised the tramways department to purchase an electric vehicle chassis for use as a tower wagon.

KING'S LYNN CORPORATION have given instructions to the Borough Surveyor to report upon the advisability of purchasing a motor tractor.

MANCHESTER CORPORATION have accepted the tender of Lookers, Limited, for the supply of two motor vehicles for the use of the Watch Committee.

ILFORD URBAN COUNCIL have accepted the tender of Mossay and Company, Limited, for the supply of a 3½-ton "Orwell" electric vehicle at a cost of £1,122.

TOTTENHAM URBAN COUNCIL have instructed the fire brigade superintendent to report as to the cost of installing a motor fire engine at the Central Depot.

HULL CITY COUNCIL have asked the Local Government Board for their sanction to the purchase of an electric tipping wagon at an estimated cost of £1,165.

TILBURY URBAN COUNCIL have accepted the tender of Messrs. Merryweather and Sons for the supply of a fire engine of the "Hatfield" type at a cost of £1,168.

GLASGOW CITY COUNCIL have been recommended to purchase four additional electric vehicles, two of 2 tons at a cost of approximately £1,168, and two of 3½ tons at £1,432 each.

THORNABY TOWN COUNCIL have been unable to obtain the sanction of the Local Government Board for the purchase of a new motor fire engine. It has therefore been decided to purchase a motor tractor to haul the old fire engine.

ROAD TRANSPORT BOARD.—The representatives of the road transport trade on the Divisional Boards of the Road Transport Board are as appended :—London, Mr. G. A. Dutfield ; Northern, Mr. H. P. Currie ; North-Eastern, Mr. G. T. Tuke ; North-Western, Mr. E. S. Hodgson ; North-Midland, Mr. G. Bentley ; South-Western, Mr. J. G. Corfield ; Wales, Mr. Evan Jones ; Edinburgh, Mr. W. T. Thomson ; Glasgow, Mr. R. Gilmour ; South-Midland, Mr. F. P. Ward ; Midland, Mr. J. A. Lycett ; Eastern, Mr. J. C. Sturton. Mr. R. L. Fergusson, the chairman of the London Divisional Road Transport Board, has moved with his staff to 5, Carlos Place, Grosvenor Square, W.1.

WELSH ROAD TRANSPORT BOARD.—Lieut. E. G. Evans has been appointed chairman and executive officer of the Divisional Road Transport Board for Wales and Monmouthshire. The members comprise two representatives of the Ministry of Food, one of the Ministry of Munitions, one representing Associated Chambers of Commerce, one representative of South Wales transport interests (Mr. Evan Jones, of Cardiff), and one co-opted (Mr. F. Wilks, of Llandudno), to represent transport interests in North Wales. This Board, similarly with others established, will be assisted by an advisory committee and by area committees at Cardiff, Bridgend, Swansea, Carmarthen, Lampeter, Haverfordwest, Newport, and Llandrindod Wells.

Digitized by Google

MOTOR TRAFFIC.

MOTOR TRAFFIC NOTES.

First Aid Instruction for Women Conductors.—Hitherto the women conductors employed by the London General Omnibus Company have received only a partial training in the rendering of first aid to the injured. As the women have been found to be reliable in most emergencies, they are now to be given a full course of instruction.

The Use of Gas at Manchester.—According to the annual report of the Gas Committee of Manchester Corporation, there are over 300 vehicles in the city running on coal gas. The gas department, the report states, has taken a leading part in the experimental work with gas for motor traction, and the system adopted by the committee has been taken as the standard in different parts of the country.

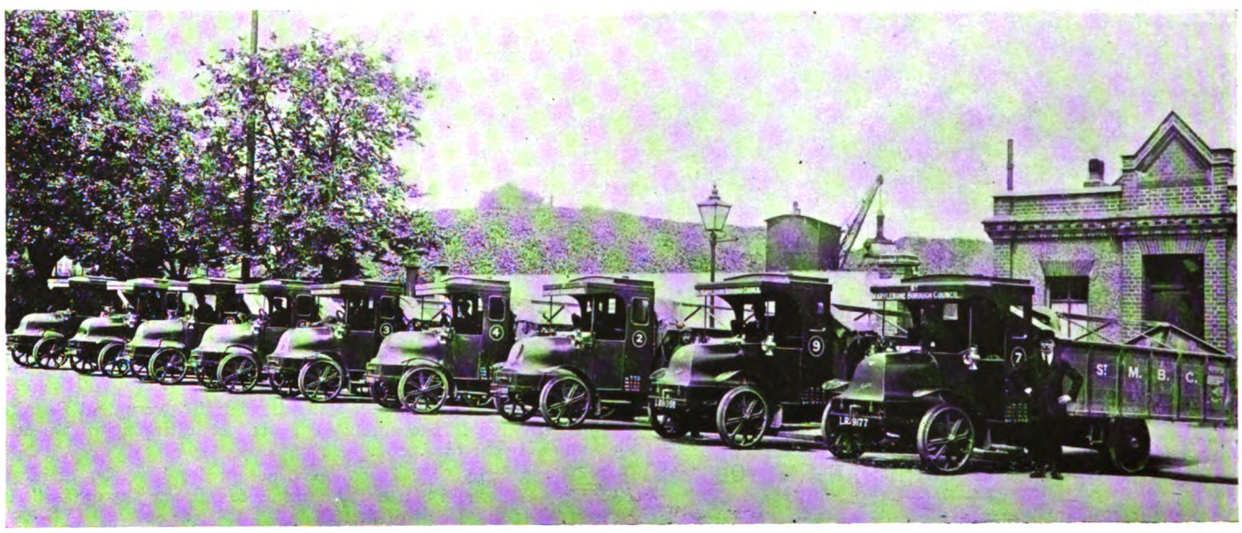
Car Owners' Changes of Residence.—In accordance with a suggestion by the Local Government Board, the London County Council have resolved not to require the taking out of a carriage licence and the payment of licence duty in respect of motor cars in cases in which, owing to petrol restrictions, the car is run on a single occasion from one place to another owing to a change of residence on the part of the owner.

Wales now possesses a centre, with headquarters at Cardiff. Mr. Butt Ekins is the local secretary.

Electric Omnibuses Unobtainable.—It was stated at a meeting of Morecambe Corporation that although the Council had last session obtained an Act of Parliament enabling them to run electric omnibuses, the Tramways Committee had not been able to induce the Ministry of Munitions to issue a priority certificate for the purchase of the vehicles. Councillor J. Birkett, the deputy mayor, complained that two years had passed without any improvement having been made in the means of communication on the sea front.

An East London Omnibus Service Withdrawn.—Replying to a resolution received from Walthamstow Council respecting the running of motor omnibuses as alleged pleasure services to Chingford on Sundays, while the tramway service has been curtailed, the Local Government Board have stated that they have no authority in the matter, but have forwarded the Council's letter to the Petrol Control Department and to the Commissioner of Police. Mr. W. Murray, the general manager of the Council's tramways, has since reported that the service has been withdrawn.

Speed of Service Motor Wagons.—Communications have been forwarded by the County Councils Association to the Admiralty and War Office with reference to the excessive speed of service motor wagons and heavy motor cars. The Admiralty, in reply,



Marylebone Borough Council's Fleet of Austin 2-3-Ton Lorries Fitted with a Special Type of Tipping Body.

Damage by Heavy Loads at Glasgow.—The Corporation have been recommended by the Labour Committee to take action in the Court of Session for the recovery of the amount of damage done to various streets by the haulage of boilers and machinery of exceptional weight. Counsel had recommended that proceedings be taken under the Roads and Bridges Act, 1878, as regards highways, and under common law for streets that do not fall within the definition of highway.

Motor Vehicle Subsidy for Japan.—As the result of the recent granting by the Japanese Government of a subsidy to owners of motor vehicles, the Japan Car Works, at Nagoya, are assembling cars from main component parts imported from America. The South Manchurian Railway Company have constructed four experimental vehicles at Dairen, while the Mitsubishi Dock Company, of Nagasaki, and the Kawasaki Dock Company, of Kobe, are preparing to enter the motor industry.

Registration of Road Transport Vehicles.—The Road Transport Order, 1916, made by the Board of Trade, came into operation on July 31. Under this Order all owners of goods-carrying vehicles were required to furnish particulars of their vehicles on the prescribed forms before July 31, 1918. The order applies to all vehicles driven by motor spirit, gas, electricity, or steam, and to horse-drawn vehicles with a capacity of not less than 15 cwt., with the exception of those vehicles used wholly or mainly in agriculture.

South Wales Centre of Commercial Motor Users.—The Commercial Motor Users' Association is actively engaged on a task that ought to have been taken up years ago. We refer to the establishment of local centres of the association. The new policy is the outcome of the success that has attended the Manchester, Liverpool, and Lancashire Centre during the past two years. South

suggest that conferences should be held to obtain some agreement as to what constitutes excessive speed, and that first-class roads can stand higher speed than those where the sub-soil is soft. From the War Office the reply was to the effect that the Army Council have issued instructions as to the necessity of proper control over the speed of military traffic.

"Safety First" in London Schools.—The excellent work accomplished during the past year by the Schools Propaganda Committee of the London "Safety First" Council, in conjunction with the teachers, is shown by the fact that 40,710 essays were written by the scholars in competition for prizes. The awards were distributed by Sir Cyril Cobb, chairman of the Education Committee of the London County Council, at an inspiring gathering held at Caxton Hall. Lord Sydenham, in the course of an address, mentioned that nearly 6,000 children under the age of 15 years were annually injured in street accidents in the metropolitan area.

Regulation of Omnibus Passengers.—In consequence of complaints that passengers frequently remained in the Sheffield Corporation omnibuses at the termini for the return journey, thus crowding out other persons, the Tramways Committee have ordered a notice to be exhibited stating that all passengers must, as a war measure, leave the vehicles at the termini. At the August meeting of the committee, the general manager reported that it would shortly be necessary to discontinue another of the omnibus services on account of the shortage of labour and petrol, and the difficulty in obtaining materials. Penicuik Council have decided to take no action upon a suggestion from one of their members that the Scottish Motor Traction Company should give preference to long distance passengers. The company, it was stated, had already decided against the proposal.

Digitized by Google

THE Tramway & Railway World
WITH MOTOR TRAFFIC SECTION

Founded 1892. LONDON, OCTOBER 17, 1918. VOL. XLIV.

ELECTRIC TRACTION ON THE CENTRAL ARGENTINE RAILWAY.

BRITISH EQUIPMENT OF A SUBURBAN SYSTEM OF 100 MILES.

The Central Argentine Railway, with a mileage of 3,300, serves the northern portion of the Argentine between Tuouman, Cordoba, and Rio Quarto on the west, and Santa Fé, Rosario, and Buenos Aires on the River Plate. The number of passengers carried on the system during the twelve months ending June, 1914, was 23 millions, of whom 16 millions were carried on the three sections which serve the north-western suburbs of Buenos Aires (Fig. 2). The explanation of the large ratio which the suburban traffic bears to the total traffic is found in the fact that Buenos Aires, with a population of over one and a half millions, contains more than one-fifth of the whole population of Argentina. The city handles more than half (in value) of the total imports and exports of the country, and new docks are under construction which will increase the capacity of the port by more than 50 per cent. All the great railways, British-engineered and British-owned, converge towards it; it is the centre of Government, and its climate is good. During the last twenty years its growth has been at the average rate of 7½ per cent. per annum, and there is every reason to believe that this rate will be maintained during the next twenty years. Realising the importance of dealing economically with the development of their suburban traffic, the directors of the Central Argentine Railway decided to electrify the suburban sections, and the work was put into the hands of Messrs. Merz and McLellan, who were instructed to act in co-operation with the consulting engineers of the company, Messrs. Livesey, Son and Henderson, the two firms being jointly responsible for the design and supervision of the whole equipment.

Fig. 1.—Retiro Terminus of the Central Argentine Railway at Buenos Aires.
Showing Electrified Lines.

On August 24, 1916, the President of the Republic, Dr. Victorino de la Plaza, inaugurated electric traction on the line from Retiro Terminus in Buenos Aires (Fig. 1) to Tigre on Las Conchas River *via* Victoria. The Central Argentine Railway thus had the distinction of being the first of the great railway lines in the Argentine to adopt the modern method of dealing with suburban traffic.

The service on the branch has operated with marked

Digitized by Google

success, not only from the engineering but also from the traffic point of view, the passenger journeys in the first six months of the year 1917 being some 11 per cent. in excess of the figures for the same period of 1916.

The complete electrification works for the suburban system include a power-station of 15,000-KW. capacity, 57 miles of high-tension transmission cables, four traction sub-stations with 14,000 KW. of converting plant, and the electrical equipment of 100 miles of single track. Power is produced in the generating station as three-phase current at 20,000 volts with a periodicity of 25 cycles, transmitted to the sub-stations, converted to direct current at 800 volts, and supplied to the trains through a third rail.

List of Contractors.

Power station buildings and complete boiler-house equipment—
Babcock and Wilcox, Limited.

Turbo-alternators, transformers, and motors—
C. A. Parsons and Company, Limited.

Condensing plant and pumps—
British Westinghouse Electric and Manufacturing Company, Limited.

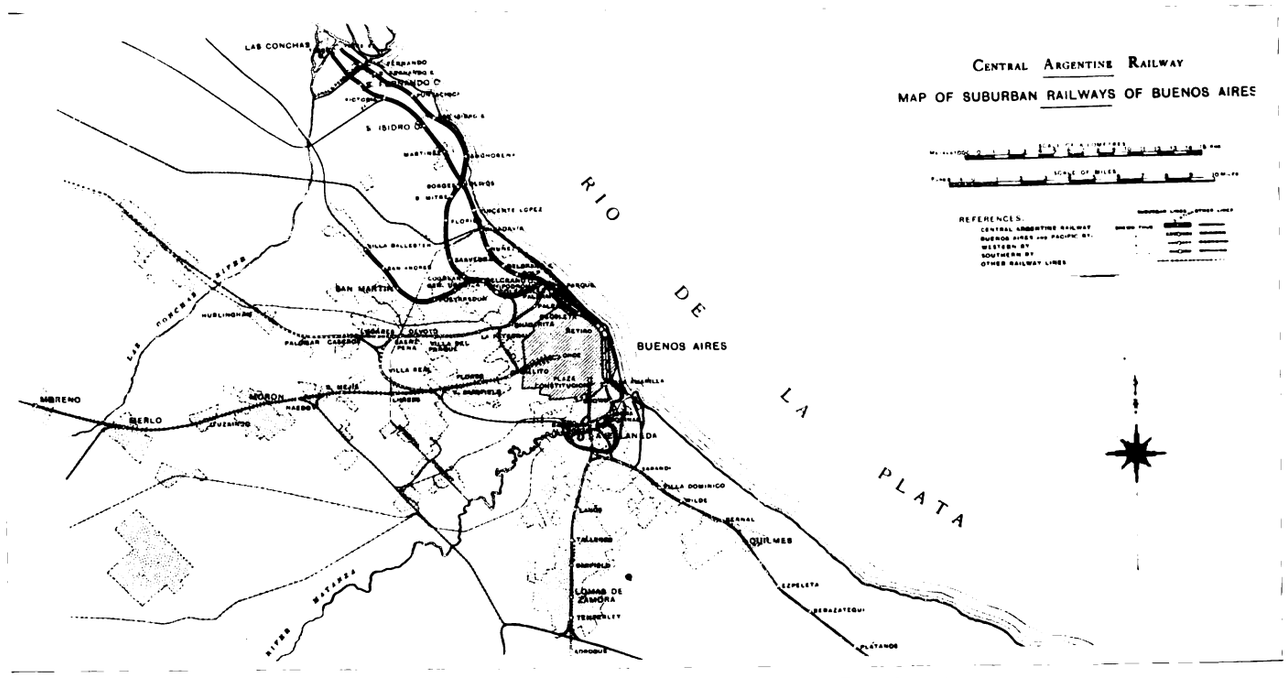


Fig. 2.—Map of Central Argentine Railway and Other Lines Entering Buenos Aires.

Switchgear in power-station, auxiliary motors, etc.—
British Thomson-Houston Company, Limited.

Rolling stock—bodies, underframes, and bogies—
Metropolitan Carriage, Wagon, and Finance Company, Limited, and Birmingham Carriage and Wagon Company, Limited.

Structural steel work for power-station, entrance way, test room, offices and sub-stations; also the cranes for the sub-stations—
David Rowell and Company, Limited.

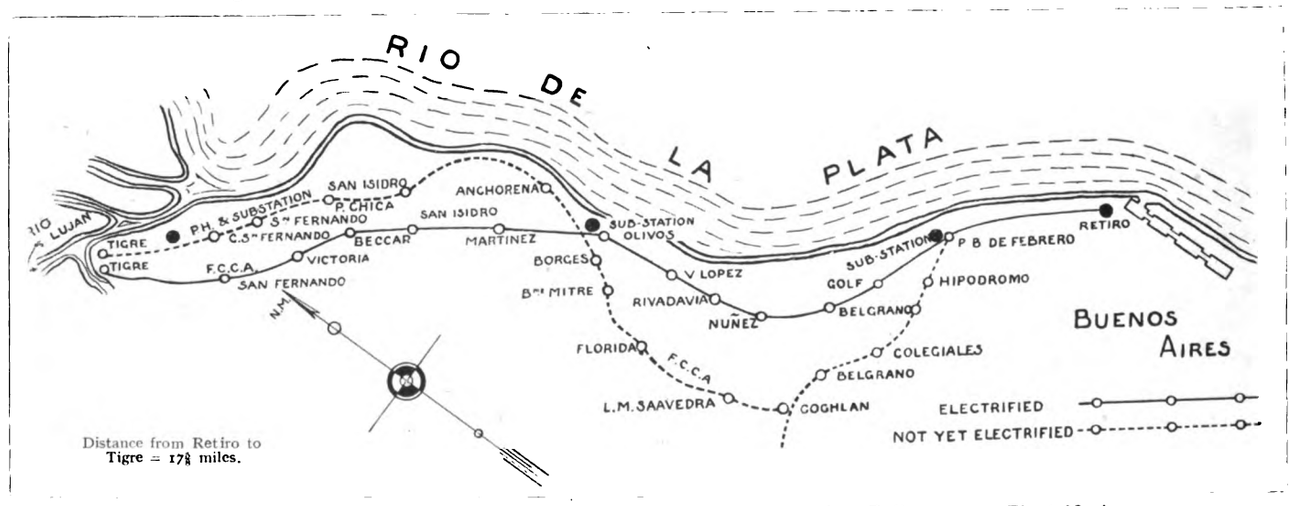


Fig. 3.—Map Showing Suburban Route of the Central Argentine Railway now Electrified.

The suburban route of the Central Argentine Railway already electrified is shown in Fig. 3, with the location of the power-station and existing sub-stations. The whole of the apparatus used in connection with the electrification was manufactured in Great Britain, and the principal contracts covered the erection of their plant by the various contractors; they are set out in the following list:—

High tension transmission and low tension track cables—
W. T. Henley's Telegraph Works, Limited.

Electrical equipment of sub-stations—
British Thomson-Houston Company, Limited.

Electrical equipment of rolling stock—
British Thomson-Houston Company, Limited.

Supervision of erection of electrical equipment of permanent way—
British Thomson-Houston Company, Limited.

The provision of the foundations for the power-station and sub-stations, the walling of the sub-stations,

Digitized by Google

excavation for cables, and the erection of the third rail were carried out by the railway company with their own staff.

POWER-STATION.

The power-house (Fig. 4) has been placed at the station of Canal San Fernando on a parcel of ground between the Tigre (Rosario) line and the Rio Lujan. The site was swampy, and in order to make a sound foundation some 3,000 ferro-concrete piles were driven down 33 feet till they reached the hard clay (tosna), which is found at varying depths all around Buenos Aires. On top of the piles a concrete raft, 2 ft. 6 in. thick, reinforced with old rails, was formed, to which pipes were laid for the cables serving the apparatus in the station. The level of the engine-room floor is 4·50 metres above datum. This was fixed with reference to the highest recorded flood level, 4·07 metres; since the station was built flood water has reached 4·38 metres above datum.

As shown in the view given in Fig. 4, the engine-room and boiler-house are arranged parallel to each other, with coal and ash handling sidings behind the latter. In front of the engine-room are a rotary converter sub-station, laboratory, and offices. A fitting shop and workmen's accommodation are provided at the permanent end of the engine-room. There is space on the site to double the capacity of the station by extending the buildings towards the river.

The buildings are steel-framed structures panelled with armoured concrete and finished with a white cement. The roofs of the sub-station and offices are concrete; that of the boiler-house is corrugated iron. The engine room roof consists of a wood ceiling covered with waterproof felt and with corrugated iron on top; this construction was required to avoid the condensation of moisture from hot humid air striking a cold corrugated iron roof.

BOILER-HOUSE.

The boilers are arranged four a side, grouped in pairs, each boiler having its own superheater and economiser. One steel chimney with an induced draught fan serves each pair of boilers, and forced draught is supplied to the furnaces by four fans in the basement.

The following are the particulars of the principal plant in the boiler-house:—

DETAILS OF BOILER-HOUSE PLANT.

Number and type of boilers—Six Babcock and Wilcox marine type water-tube boilers.

Normal evaporation of each boiler—20,000 lb. of water per hour.

Working steam pressure and temperature—210 lb. per square inch, 600° F.

Heating surface of each boiler—4,170 square feet.

Grate area of each boiler—98 square feet.

Type of stokers—Underfeed.

Type and size of economisers—Green's; 200 pipes in each.

Number of fans—Eight "Sirocco" fans.

Number and type of feed pumps—Two impulse turbine driven centrifugal pumps; two vertical reciprocating, Nichols type; capacity of each feed pump, 75,000 lb. per hour.

The furnaces are lined with Glenboig bricks, and are suitable for burning either Welsh or Durham coal. The stokers are of the underfeed type operated by steam rams. In anticipation of a shortage of coal two of the boilers were arranged for oil firing, and a complete equipment of the Wallsend-Howden system has been put into operation, with storage tanks, filters, and pumps. As the shortage of both coal and oil, due to war conditions, became more acute, other boilers were adapted for wood firing, and the fuel consumption figures for a recent week are:—Coal, 72·5 tons; oil, 15·5 tons; wood, 690 tons.

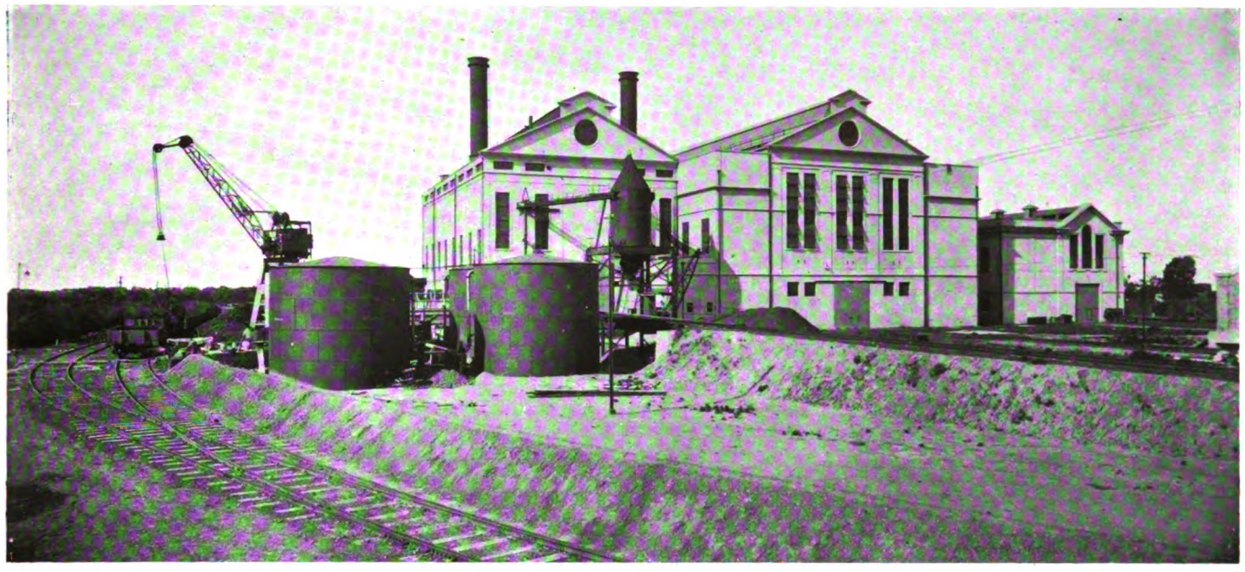


Fig. 4.—General View of the Electric Power-Station of the Central Argentine Railway at Canal San Fernando.

The wood burnt is red and white quebracho and algarrabo, and the relative values of the different fuels are roughly as follows:—1 lb. of coal (calorific value, 15,000 B.T.U.) is equivalent to 0·8 lb. of oil, 2·5 lb. of red quebracho, 3·3 lb. of white quebracho, or 3·3 lb. of algarrobo.

Labour and transport difficulties have become very acute recently, and the supplies of oil and wood have become so precarious that experiments have been made in burning maize. The results obtained indicate that maize is a slightly better fuel than red quebracho.

The combined efficiency of the boilers and economisers works out at about 85 per cent. when Welsh coal is being burnt.

The steam piping consists of a range of solid-drawn pipes, the flanges of forged steel being rivetted in the case of pipes of 7-in. diameter and over, and screwed in the case of smaller pipes. The blow-off piping is solid-drawn steel, and connects to a blow-off sump formed of a boiler drum. The exhaust and escape

Digitized by Google

steam piping is lap-welded. A high-pressure water main served by the feed pumps gives a supply to fire hydrants throughout the boiler-house, and also for boiler tube cleaning. The feed pumps draw their supply from hot-well tanks in the pump-house, and make-up water comes from a storage reservoir constructed alongside the power-station to two storage tanks erected above the hot-wells. Water is pumped from the River Lujan through a 6-in. pipe to the reservoir, and is there treated with alumino-ferric to precipitate the sediment which the river water contains.

Coal and Ash Handling Plant.

The storage and handling of coal is provided for by means of an elevated railway track running alongside the boiler-house at firing floor level, a gantry parallel to the buildings, and carrying a level-luffing jib crane, with a grab of two tons capacity and two sidings at ground level (Fig. 4). The coal trucks are brought on the site from the main line at Canal San Fernando Station, and the coal can be grabbed from them and either filled direct into two 15-ton receiving hoppers, or into bottom-discharge wagons, which can be hauled along the elevated siding by a winch till they come over the receiving hoppers; thence the coal passes through crushers to gravity bucket conveyers. These elevate it to a tray conveyer, which takes it to coal bunkers above and between the two ranges of boilers. The coal bunkers have a capacity of 1,000 tons; they are built of mild steel plates lined with armoured cement, and the bottoms are "V" shape in section. Alternatively the arriving trucks can be pushed direct up the 1 in 25 incline to the elevated siding, and the fuel—coal or wood—can be discharged direct on the firing floor by hand. The stock coal is grabbed from the trucks and stored below and around the gantry in a coal deposit floored with sleepers, and constructed within range of the jib crane, which can plumb to a radius of 50 feet. The capacity of the store is 10,000 tons. The ash-handling arrangements comprise a suction ash plant with two 38-H.P. exhausters, which take the ashes from the furnace ashpits through electrically-operated crushers and specially heavy cast-iron pipes to a mild steel ash bunker of 80 tons capacity, lined internally with armoured concrete. The bunker is erected at the end of the boiler-house at such a height that railway trucks can pass underneath to receive and remove the ashes. Alternatively the ashes can be taken from the ashpits by half-ton wagons along rail tracks laid along each side of the boiler-house basement, and deposited outside on the site.

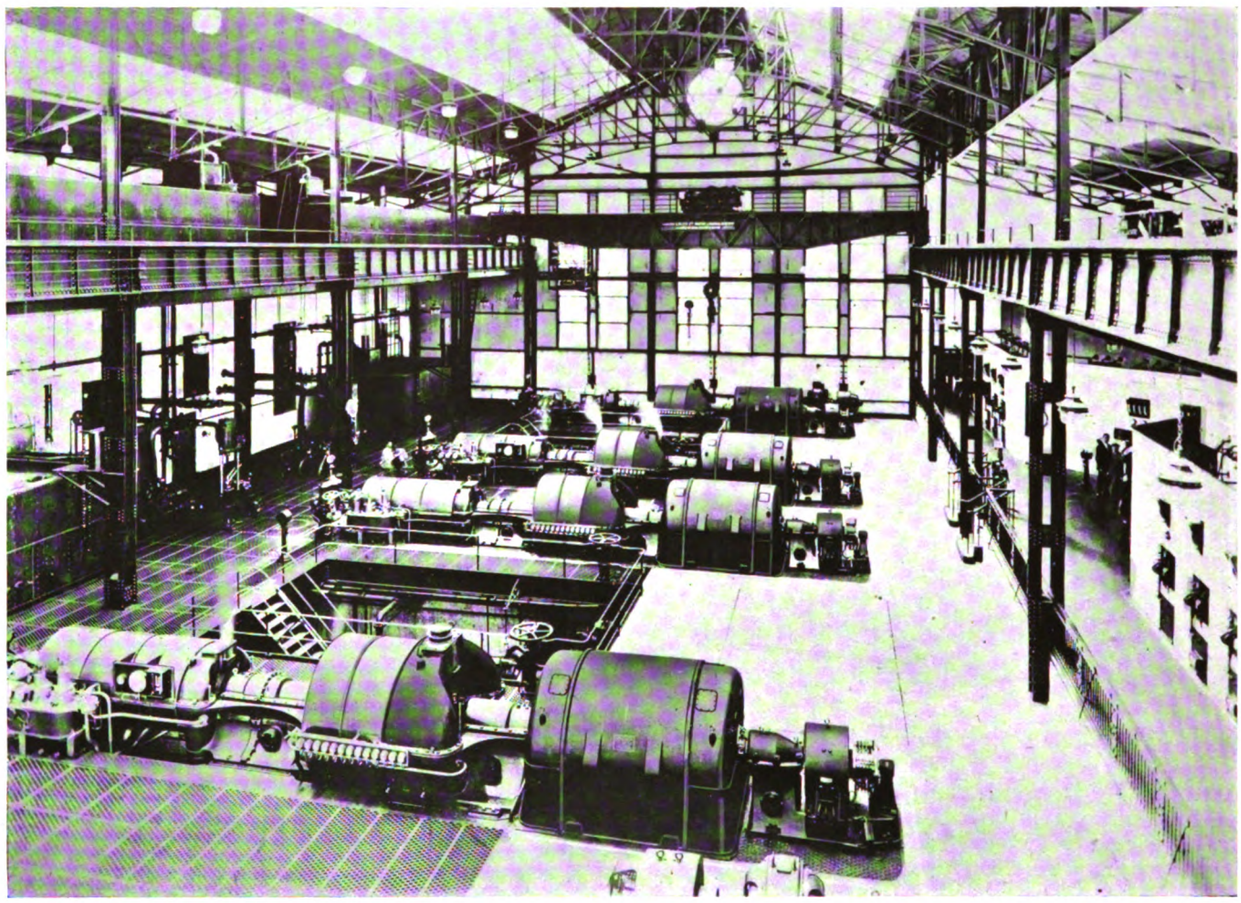


Fig. 5.—Interior of Engine Room with Four Horizontal Turbines.

Engine-room.

The generating plant is so arranged that provided one boiler is steaming any one of the turbo-alternators can be started up, and can give a supply to the main busbars and to all the station auxiliaries. In addition, the breakdown of anything comprised in one generating unit will not prevent the operation of the remaining sets. There are four turbines in the engine-room (Fig. 5); each has its own steam-driven oil pump for use when starting up, its own condenser with air and water extraction pumps, and an independent circulating water pump. On the electrical side it has a self-excited exciter direct-coupled to the alternator shaft; leads from the alternator run direct to the "unit" transformer, which steps down the generated voltage from 2,500 to 440, and gives a

Digitized by Google

supply to the unit distribution board. From this board are fed the motors which operate the auxiliaries definitely belonging to the generating set to which it is attached, viz., those driving the air pump, exhaust valve, step-up transformer, oil pump, and circulating water pump. The other station auxiliaries which are common to the whole station, e.g., economiser and fan motors, are fed from a station distribution board divided into four sections, each of which can be isolated at will and fed from one of the unit boards, the feeders to the auxiliaries being so distributed among the sections that failure of one section will not put out of operation all the individual pieces of any auxiliary gear. The main leads from the alternator (1 square inch single-core cable) run to a step-up transformer, housed in the same compartment as the unit transformer, which steps up the generated voltage from 2,500 to 20,000, at which pressure the power is supplied to the station busbars. The station equipment as a whole is divided into two independent parts either capable of running without the other. The main busbars are divided in the middle by a busbar sectioning switch; two generators feed each half, and from each half a supply is given to a "station" transformer. Either of these station transformers can feed the station distribution board, the four sections of which are normally run coupled up. Connected to the extreme sections of the station distribution board are two motor generators giving a supply for lighting the station and for charging the two batteries, which form a duplicate source of power for the tripping coils on the switches and the indicating lamps on the switchboard. The main outgoing feeders are distributed between the busbar sections, so that failure of one section will not shut down any sub-station.

Details of the engine-room plant are given below:—

DETAILS OF ENGINE ROOM PLANT.

Number and type of turbines	Four Parsons' horizontal reaction turbines with high and low pressure cylinders.
Working conditions	Steam pressure, 200 lb. per square inch; steam temperature, 600° F.; vacuum, 2½ in. of mercury; normal speed, 1,500 revolutions per minute.
Current generated...	Three-phase, 25 periods, 2,500 volts.
Economical output of set	3,000 KW. at 0·85 power factor.
Maximum continuous capacity of alternators	3,750 KW. at 0·85 power factor.
Momentary capacity of set	5,500 KW. at 0·85 power factor.
Type of condensers	British Westinghouse surface condensers; cooling surface, 8,250 square feet; cooling water required, 6,800 gallons per minute, giving an absolute pressure of 2 in. of mercury with 45,000 lb. of steam per hour each, and cooling water temperature of 80° F.
Air and water extraction pumps ...	Westinghouse Leblanc, direct driven by 40-H.P. electric motors at 1,440 revolutions per minute.
Circulating water pumps	Four Gwynne vertical rotary pumps with Westinghouse motors, 240 H.P., running at 720 revolutions per minute, and each delivering 6,800 gallons per minute.
Purified water, bilge, and emergency pumps	Gwynne vertical rotary, driven by 13-H.P. electric motors running at 1,440 revolutions per minute.
Air exhausters ...	Gwynne air pumps.
Type of transformers in power-station	British Westinghouse three-phase, shell type, oil-immersed, oil or air cooled.
Main step-up transformers	Ratio, 2,500/20,000; connections mesh-star; continuous capacity, 4,860 KVA.
Unit transformers...	Ratio, 2,500/440; connections mesh-star; continuous capacity, 250 KVA.
Station transformers	Ratio, 20,000/440; connections mesh star; continuous capacity, 1,250 KVA.
Lighting motor-generators ...	British Thomson-Houston; 440-volt induction motor; 55-KW. direct current generator; 10-KW. battery-charging booster.
Engine-room crane	Babcock and Wilcox 40-ton crane, with 5-ton auxiliary hoist; span, 60 feet.

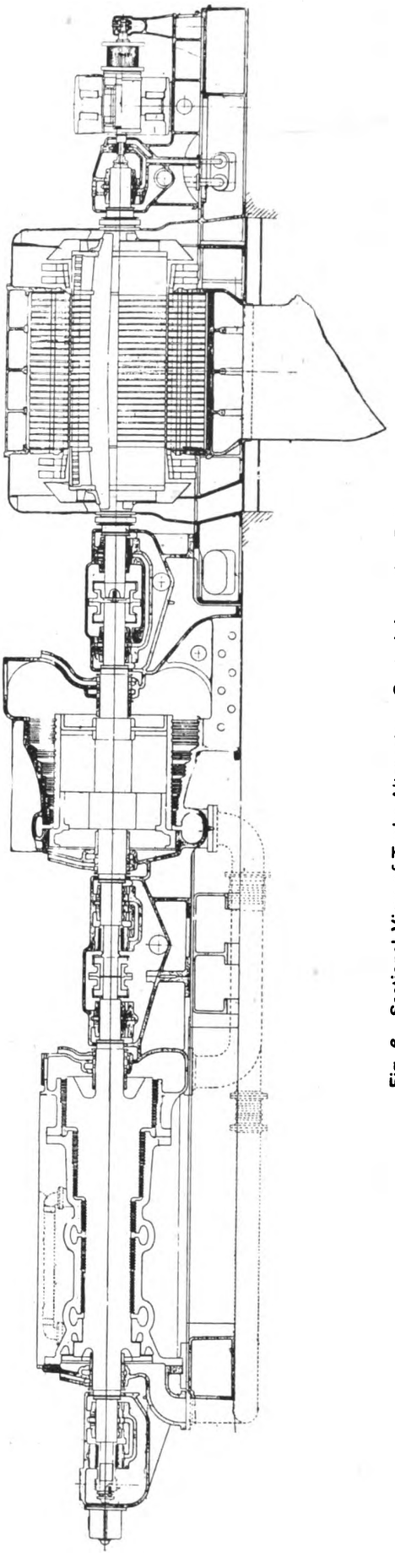


Fig. 6.—Sectional View of Turbo-Alternator—Central Argentine Railway.

Digitized by Google

The high and low pressure portions of the turbines are in separate cylinders, the high pressure cylinder being of cast steel. This was steamed with superheated steam for 24 hours both before and after blading. The rotor shafts and drums are forged solid of steel with a tensile strength of 35 to 40 tons and an elongation of 20 per cent. The blades are brass. Each turbine is connected by an expansion pipe to the condenser situated underneath it. Between the turbine and the hand or electrically operated main exhaust valve is an atmospheric release valve. The governor is mechanical and automatic in action and so constructed that the speed between no load and maximum load can be varied 5 per cent. up or down while the turbine is running. The speed can also be controlled by hand or from the switchboard by electrical means. Oil is supplied continuously under pressure to the bearings, whence it passes through strainers to the oil reservoir to be picked up by an oil pump and forced through the tubes of an oil cooler. Fig. 6 is a sectional view of the turbo-alternator.

The alternators are totally enclosed and ventilated by fans on the rotor, which draw air from the basement through a dry air filter and discharge it outside the engine room. The combination of an alternator and a step-up transformer as one generating unit permitted the actual alternator voltage to be selected so as to give the most simple and robust stator winding, the stator slots, which are completely closed, each containing only one conductor. The rotors are of the built-up plate construction with a distributed winding in slots, and are fitted with mild steel slip-rings.

The step-up and unit transformers belonging to each generating set are housed in a separate chamber in the basement with hatchways in the engine room floor, through which they can be handled by the crane. The chambers are ventilated by fans which draw air from the basement, and provision is made for running off the oil from the transformers to the outside of the building in case of fire. Each step-up transformer has its own oil-cooler, through which the oil is circulated by a rotary pump driven by a 10-H.P. 440-volt 3-phase squirrel cage motor. The unit transformers are air cooled. The station transformers are situated in separate chambers at the ends of the engine-room basement, and are air cooled.

An oil store was built on the power station site to contain the supplies of transformer and lubricating oil. An electrically operated oil-purifying outfit is used for filtering and drying the transformer oil after it has been in service for some months.

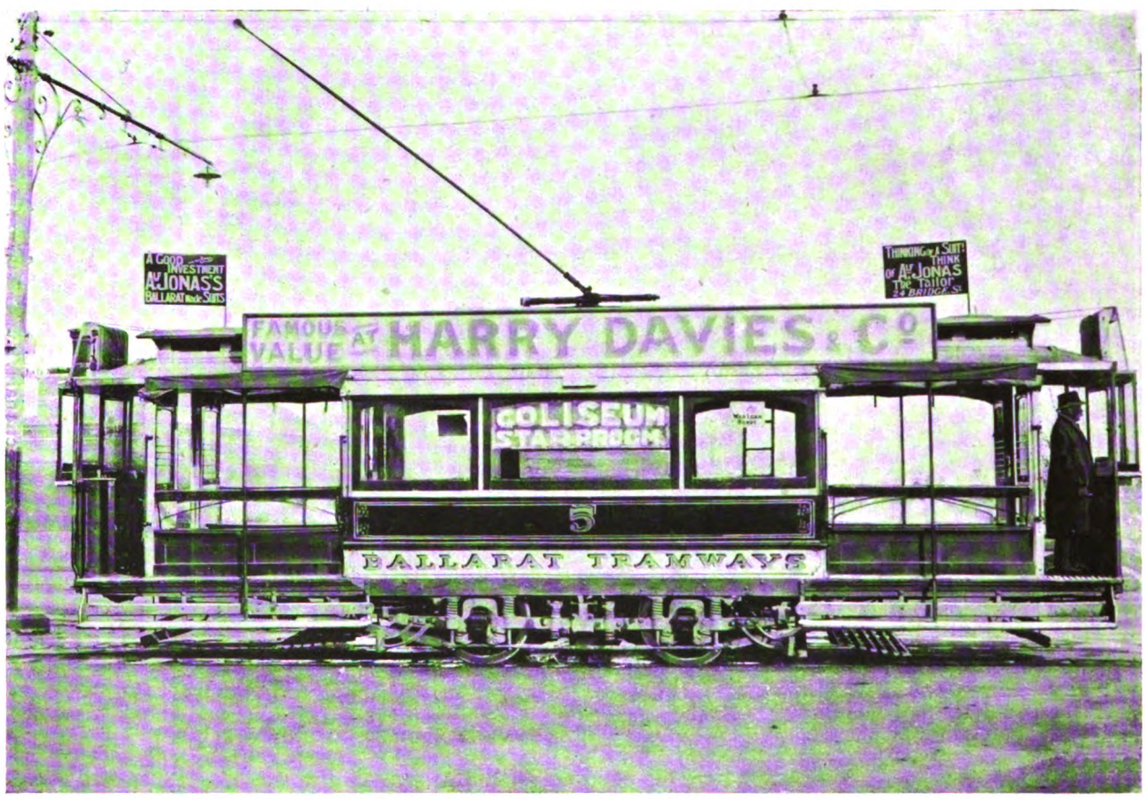
(To be continued.)

THE ONE-MAN CAR IN AUSTRALIA.

Through the courtesy of Mr. P. J. Pringle, chief engineer and general manager of the tramways of Ballarat and Bendigo, we are able to give some interesting particulars regarding the fare arrangements for the one-man cars which are in use on the undertakings named.

In the one-man car there is at each end of the car, and opposite both entrances, a hinged gate with a notice " Enter front end." A simple form of fare-box, of which a sketch is produced, is placed on the partition just behind the driver, and the upper part of the box has a glass window back and front, making it possible for the driver and passengers in the car to see exactly the coin which drops on to the collecting plate. After each lot of people have paid, this plate is tipped by the driver, so that the coins fall into the lower receptacle.

A looking-glass is fixed in the upper part of the box at a suitable angle, so as to reflect light on the coins dropped on to the collecting plate, which permits all the coins being seen by a considerable number of

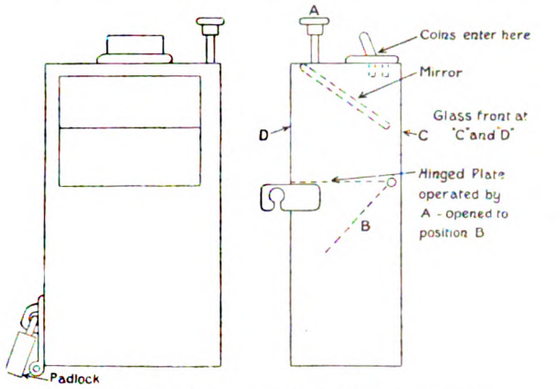


One-Man Car—Ballarat Tramways.

Digitized by Google

passengers in the car. This effects a good moral check on the payments made in the fare box, and results in a more satisfactory fare collection and fewer mis-fares than with the ordinary ticket system.

Platform accidents, due to people boarding and leaving the car, have been reduced to one-sixth of the number when the car was manned with a motorman and conductor. "One-man" drivers, in view of the extra duties they are carrying out, are paid at the rate of 10d. per day above the ordinary motorman's rate.



Fare Box Used on One-Man Car at Ballarat.

At each end of the car, just above the dash, is a hinged notice-plate marked on one side "Pay as you enter," and on the other side "Pay as you leave." The "Pay as you enter" sign is visible at both ends of the car in the case of cars travelling from the suburbs to the centre of the town. The "Pay as you leave" sign is similarly exhibited on the reverse journey.

This system, introduced about five years ago on the Ballarat and Bendigo tramways, is working with every satisfaction. Latterly three other Australian tramways have decided to adopt the system, and there are others in New Zealand considering it. Within the last three or four years America has taken up the one-man car with great seriousness, there being over 160 undertakings operating these cars, with over 1,000 cars in use.

These facts, Mr. Pringle maintains, are sufficient to justify English tramway managers in giving the system serious consideration in order to conserve man and woman power, reduce operating expenses, and avoid as far as possible the raising of fares.

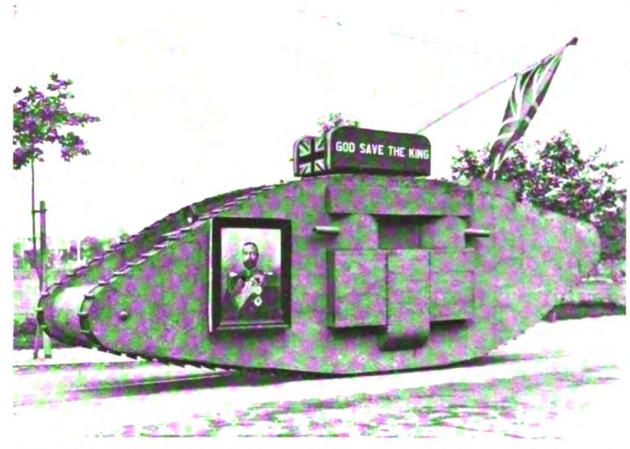
The one-man cars in Ballarat are also distinguished by a novel form of advertisement consisting of a metal flag placed at each end of the roof as shown in the illustration of the car. The flags measure 2 ft. 6 in. long by 1 ft. 8 in. wide; they are made of thin sheet-iron with a stiffening wire around the edge, and are attached to a steel rod which projects 7½ in. below the bottom part of the flag. This drops into a piece of tube with a flange attached to it, which latter is bolted to the car roof. The end of the rod attached to the flag is conically shaped and hardened, and drops into a hardened coned bearing. The flag therefore revolves very readily, and sways to and fro with the wind and movement of the car. Therefore, being a moving advertisement, it attracts more attention than the ordinary fixed ones commonly in use. The idea was worked out by Mr. E. H. Grenfell, collector in the Ballarat electricity department.

Ten of these flags bring in an annual revenue of £100. The tramway company guarantee that they will be run on the regular running cars. To effect this, they can be readily changed over to permit of a car being sent to the depot for repairs by removing the flag out of the tube socket into one fixed upon another car.

A TRAMWAY TANK AT SHANGHAI.

The accompanying photographs illustrate a tramway "tank" which the Shanghai Electric Construction Company has had in service under different disguises. Mr. Donald McColl, the general manager, writes that its first appearance was in celebration of Empire Day. The design, as will be seen, is quite realistic. The caterpillars revolve at the proper rate in relation to the speed of the vehicle, and are operated from the car motors by means of gearing, belting, and pulleys.

Although the tank looks substantial enough, it is really of inexpensive construction. The rivets, for instance, are merely stamped out from old kerosene tins, and cost nothing at all for materials and only a trifle for labour. The tank did good service in connection with the Chinese Tank Week, during which in a few days over £100,000 was contributed by Chinese to British War Loans. In celebration of the King's birthday the tank bore large portraits in silk, being illuminated by means of electric lamps placed behind them.



SELECT COMMITTEE ON TRANSPORT.

The Select Committee on Inland Transport appointed last session by the Government resumed their sittings on October 10. Prior to the recess several preliminary meetings were held, the proceedings being private. A sub-committee appointed by the main body to take evidence in Ireland held a number of sittings in that country. The Select Committee is composed of the following members of the House of Commons:—Mr. Wilson Fox (chairman), Mr. A. Acland Allen, Sir A. Shirley Benn, Mr. Davison Dalziel, Mr. Duncan, Mr. W. Field, Mr. J. D. Gilbert, L.C.C., Colonel Gretton, Sir F. Hall (a former chairman of the Highways Committee of the London County Council), Colonel F. S. Jackson, Mr. Keating, Mr. R. Mason, Colonel Wedgwood, and Mr. Lewis Haslam. Lt.-Col. A. St. John Cooke, D.S.O., Controller of Roads and Bridges, War Office, has been lent by the Army Council to the Select Committee. He is a member of the Road Transport Board and served as a transport officer in the South African War.

Digitized by Google

THE
Tramway and Railway World

FOUNDED IN 1892 AND PUBLISHED BY
THE TRAMWAY AND RAILWAY WORLD PUBLISHING COMPANY, LIMITED,
AMBERLEY HOUSE, NORFOLK STREET, LONDON, W.C.2

SUBSCRIPTION RATES

THE TRAMWAY AND RAILWAY WORLD can be obtained, post free, at the following rates :

FOR THE UNITED KINGDOM—Twenty-five Shillings per annum.
FOR ALL PLACES ABROAD—Thirty Shillings per annum.
Single Copies—One Shilling (Postage, 2 pence—Abroad, 5 pence).
All back numbers—Two Shillings.

THE ANNUAL SUBSCRIPTION INCLUDES 64 ISSUES, OF WHICH 12 ARE ILLUSTRATED NUMBERS.

In consequence of the restrictions on the use of paper, readers will be unable to obtain copies of THE TRAMWAY AND RAILWAY WORLD unless a definite order be given in advance. Those who order copies in this way from newsagents and experience any difficulty in obtaining them should communicate with us.

THE EDITORIAL AND PUBLISHING OFFICES OF
THE TRAMWAY AND RAILWAY WORLD
ARE AT AMBERLEY HOUSE, NORFOLK STREET,
LONDON, W.C.2

Telephone No.: GERRARD *2948.*
Telegraphic Address: "TRAMIGRO, ESTRAND, LONDON."

LONDON, OCTOBER 17, 1918.

The Municipal Tramways Association Meeting.

In view of the prevailing conditions the seventeenth annual meeting of the Municipal Tramways Association, which is reported in full in this issue, was surprisingly well attended. It is by no means easy for tramway managers and committeemen in these days of shortage of staff and general strain to leave their personal duties in order to turn their attention to the welfare of the industry as a whole. Then, too, the meeting unfortunately synchronised with the outbreak of local strikes by railway employees, and for a time it appeared that railway travelling generally might become impracticable. Happily the firm attitude of the Government and the wide-spread disapproval of the public quickly convinced the men that their action was disloyal, and unjustifiable; and the strike was abandoned on the day the conference met. Delegations were present from sixty-one municipal authorities, and most of them included the tramway manager and several members of the tramway committee. It should be gratifying to the Executive Council of the Association that tramway committees throughout the country recognise so generally the value of the Association and the advantages that they derive from it. During the past year its services have indeed been indispensable; and in view of the closer organisation of the industry now taking place, it is destined to bear an increasing share of the responsibilities of local authorities in their tramway work. There are still a number of municipal tramway committees which are not members of the Association; and the time has come when they should ask themselves whether they are not neglecting a plain duty, both to their own undertaking and to the industry, by neglecting to join the Association. In the days of difficulty that will follow the war, the industry must be closely organised, and the first step is for every tramway undertaking to secure enrolment in its proper industrial parliament. The interest and importance of the proceedings at the meeting at Leicester should encourage additions to the membership. Delegates came from all parts of the country with the single purpose of considering in a business-like way the subjects that were placed before them; and the proceedings were followed with close attention throughout. The mistake of attempting to consider too many subjects was avoided. Only one paper was read—that by Mr. Hatton, who dealt with the "Post-war Position of Electric Power Supply"—and there was thus a reasonable opportunity for discussion, although not all the members who desired to speak found time to intervene. It was necessary, however, to limit the discussion to the Thursday morning session in order to deal in the afternoon with the important report of the Executive Council on the formation of a national joint council for the tramway industry. The discussion occupied the whole of the session, but as the project is still in the formative stage, it was considered desirable that members should be able to speak on the matter in the freedom of a private meeting, and no report of what proved to be an interesting and profitable discussion is given. That the members thoroughly approved of the steps taken by the Council in the matter was indicated on the following day when the report for the year was unanimously adopted. The Council is thus empowered to proceed with the negotiations, and there is good reason to hope that a fair and workable scheme in definite form will before many months be submitted for the

Digitized by Google

approval of municipal authorities. At the concluding session of the meeting, officers for the following year were, as is usual, elected. By the unanimous choice of the members, Mr. T. B. Goodyer was chosen for the office of president—an honour well merited by his services to the association and the tramway industry. His year of office will be one of unusual stress, but with his energy and tact it cannot fail to be a successful one.

Select Committee on Transport.

In the interest of tramways, light railways, and road motor authorities it is imperative that answers should be forthcoming to two questions. The first is, have they considered the subject of putting forward evidence before the Select Committee on Transport. The second is, have any steps been taken to urge the Government to carry out the recommendation made in the report of the Sub-committee of the Reconstruction Committee dealing with rural transport by light railways and road motor vehicles, which appeared in our issue of September 12. The recommendation was to the effect that the whole question of better transport of every description should be made the subject of detailed inquiry and report by a special sub-committee. If, as appears to be probable, the appointment of the Select Committee on Transport, towards the end of last session, was in part the answer of the Government to the aforementioned report, road traction interests will be able to concentrate their energies upon seeing that their case for reform is put in its entirety before the Select Committee of the House of Commons. How favourable is the opportunity presented will be seen by a glance at the following terms of reference :—

> To consider what steps, if any, it is desirable to take to develop and improve the internal facilities for transport within the United Kingdom ; to secure effective supervision and co-ordination ; to ensure that such development and improvement shall be adequate and suitable to meet the national requirements ; and to make recommendations.

Not only have the Committee power to send for persons, papers, and records, but they can appoint from outside such additional persons as they may think fit to serve on any sub-committee which they may decide to establish. There is also the customary power to report from time to time. Prior to the recess the Committee held several preliminary meetings, which have not been reported, owing, it is alleged, to the desire of the Board of Trade that the proceedings should be private. The Committee resumed their sittings on October 10. It is difficult to conceive that Sir Albert Stanley, who introduced publicity as the most potent method to increase the prosperity of the London traffic group, would consent to the adoption of a course that would rob the proceedings of the Committee of half of their value. No time should be lost by those concerned in road traction in offering evidence to the Committee, and in urging the appointment of a sub-committee of experts to report upon their special needs. Several reports are in existence to support their case, for besides the document to which we have already referred there are the recommendations of the Reconstruction Committee in favour of a reform of Parliamentary Bill procedure in relation to traction and other public utilities. In addition, the Prime Minister declared at Manchester a few weeks ago that railways, light railways, and the like enter into every phase of national prosperity, notably housing and agriculture, while on October 4 the President of the Local Government Board, replying to a deputation from the Federation of British Industries and the National Alliance of Employers and Employed on the matter of housing, asserted with truth that an equally important question is the provision of tramways to connect the new housing areas with the towns.

Glasgow Tramway Finance.

The remarkable and exceptional position of the finances of Glasgow Corporation Tramways, as revealed in the accounts for the past financial year, is worthy of special notice. This is the first year in which the effect of the total discharge of the undertaking from capital liabilities makes itself manifest. In the past the half-penny fare has been a great success in Glasgow—a greater success undoubtedly than in any other town—and this may be credited partly to local conditions and partly to excellent management. Under the stress of war conditions other undertakings have been obliged to abolish half-penny fares. Not so Glasgow, however. The revenue increased, as compared with the previous year, by about £150,000, but the working expenses rose, in round figures, by £200,000. The amount set aside for renewals and depreciation, £124,000,

Digitized by Google

was nearly double that of the previous year. Yet the net profit available for transfer to the Common Good, £177,000, showed an increase of some £16,000. The explanation of this result is that for the first time no interest on capital and no contribution to sinking fund were chargeable. These items in previous years approximated to £200,000 per annum. There had been a reduction in revenue derived from interest on investments of £70,000, so that the amount which could be carried to net revenue account was down by £123,000. It was from the reduced figure that interest, sinking fund, depreciation, etc., would have to be met. It will thus be seen that if capital charges had remained there would have been no surplus for the Common Good at all; in fact, there would have been a debit balance of about £23,000. This, of course, could have been prevented and a surplus of £27,000 shown by allocating to depreciation and reserve only the same amount as in the previous year. Taking into account the great increase in working expenses and the retention of the half-penny fare, this is indeed a remarkable and creditable showing. But even in Glasgow it seems tolerably clear that but for the abolition of capital charges a drastic revision of fares would have been necessary if anything like the net results of former years was to be attained. It may be noted that the traffic receipts per passenger were ·782d., being an increase of ·13d., while the passengers increased by over 42 millions, or about 10 per cent. The traffic receipts per car mile, at 12·832d., showed an increase of 1·24d., while the working expenses (exclusive of war expenditure) were 8·682d., an increase of 1·753d. It follows from the various figures that if expenses do not further materially rise it may be possible for Glasgow to continue the half-penny fares. No other tramway undertaking is, however, in the favourable position of being free from capital charges.

The Industrial League.

The foremost place in the mind of the nation is necessarily occupied by the war, so long as it shall last. But next in importance is Reconstruction. The requirements of the war and of reconstruction are in many respects different. But there is at least one requirement which is common to both and which may be summed up in the word "co-operation." The war has resulted in a tremendous output of co-operative effort on the part of all classes of the community, both under the direction of the State and also through private channels. The value of all this hardly needs dwelling upon. But what is perhaps not always obvious is that co-operation will be equally necessary for reconstruction. In some respects indeed it will be even more necessary, because in regard to the war there is, generally speaking, unanimity of view; but in regard to reconstruction there will be involved problems on which very pronounced differences will inevitably arise between various interests. We therefore commend and support such a movement as that represented by the Industrial League, which has, as its declared object, "the improvement of relations between employers and employed." It was founded about three years ago, and it has received the recognition and approval of prominent men on both sides, or as we prefer to put it, in both departments, of industry, as a valuable means of mutual education and as a useful channel for the interchange of opinion and information. Its tendency is clearly in the direction of promoting understanding and sympathy between the parties, which is a necessary condition of that co-operative effort which will be essential if the demand for productive work after the war is to be sufficiently met. It is in accordance with the recommendation of the Whitley Committee in favour of the self-government of industry by means of trade councils representative of employers and employed. A few such are already at work and several others, including one for the Tramway Industry, are in process of formation. In concluding we may point out that the Industrial League has the hearty sympathy and support of the Minister of Labour, who, in a foreword to the first issue of its quarterly journal, commends it as "a body which deserves every support in its aim to elevate all without hurting any, which makes appeal to men of faith in their country's destiny, to those who believe in wisely ordered progress and balanced enthusiasms." "For," adds Mr. Roberts, "it is with these that abide the surer hope for the enduring greatness of our country and the well-being of its people as a whole."

Digitized by Google

THE MUNICIPAL TRAMWAYS ASSOCIATION

(INCORPORATED)

Seventeenth Annual Meeting, held at Leicester, September 26 and 27, 1918.

The seventeenth annual meeting of the Municipal Tramways Association was held on September 26 and 27 in the Council Chamber of the Town Hall of the ancient borough of Leicester. The delegates numbered well over a hundred and represented 61 municipal authorities. Adhering to the custom that has been adopted during the war, the meeting was limited to a day and a half, and the programme was confined to business proceedings. The one paper read dealt with a topic that will before long be much discussed by every local authority that possesses electricity works or a tramway undertaking. Great developments are in prospect with regard to organisation for the supply of electric energy, and all existing authorities may be involved by the drastic changes which may be found necessary in the national interest. The subject is therefore of immediate practical concern to all those interested in electric traction, and merited a place in the business-like agenda.

At the opening session on the Thursday, the Mayor of Leicester (Alderman J. North) extended a cordial welcome to the Association in a speech which showed that, although not a member of the Leicester Tramways Committee, he was by no means unacquainted with the difficulties that from time to time have been encountered and successfully overcome by that committee. He paid a fine tribute to their work and to the skill and ability of their permanent officials. In Leicester they were proud of their tramways, and notwithstanding occasional criticism the people were well satisfied with the service.

At the conclusion of the Mayor's remarks, Alderman S. Flint (chairman of the Leicester Corporation Tramways Committee), the President of the Association during the past year, took the chair and delivered his presidential address. After some interesting reference to the historical associations of Leicester, he briefly reviewed the work of the year, which he described as much greater than that of any previous period, a statement which there is little doubt all the members of the Council heartily corroborated. The President made particular allusion to the secretarial duties, which had become so heavy that unless extra assistance were obtained, he feared no one would be willing long to occupy the position, and he urged that the Executive should be empowered to make suitable arrangements for the work of that office. The address showed the manifold activities of the Council, and should enable the members, as the President desired, to appreciate the extent of the work of the Association. In conclusion, he thanked the officers and members for the cordial support given to him during his year of office. On the motion of Councillor Raine (Hull), and seconded by Bailie Montgomery (Glasgow), a vote of thanks was given to the President for his address.

Mr. Ernest Hatton, engineer and general manager of Newcastle Corporation Tramways, then presented his paper on "Some Notes and Considerations on the Post-war Position of Electric Power Supply." The paper was read with good effect and notable clearness, and was listened to with close attention. Mr. Hatton made his position, which seems to have been misunderstood in some quarters, perfectly clear. He was not in any sense a reactionary. In the interests of the whole country progress in the development of electric power supply was necessary, but he deprecated too optimistic anticipations of the benefits to be derived. Implying that the controlling authorities were satisfied that the electrification of the railway systems of the country was desirable, he said that this policy would lend itself to the most advantageous method of setting up the general power supply all over the country, for the railways touched almost all centres of industry and population, and as a rule provided the shortest routes for laying main trunk supply cables. The best solution of the question of electric power supply could, however, be obtained only by careful investigation, and he was of opinion that for a practical demonstration of the policy of general power supply over a large area, a particular district in the North-east of England, which he mentioned, should be chosen. Whatever power boards were set up in an area, they should in every case have a majority control of public representatives elected by the area, together with the representatives of large consumers. The proposed plans would take time to accomplish, but their adoption would ultimately lead to the greatest good of the community.

Mr. McElroy, in opening the discussion, emphasised the extent of power required for traction. At least 25 per cent. of the total output of the power stations in the United Kingdom was used for tramway purposes, and the tramways, he thought, provided central station engineers with the best paying class of customers they had. It was therefore not out of place that the subject should be considered by the Association. He looked for the development of power supply in a way that would benefit all industries, including tramways, and he welcomed the two valuable reports which had been issued on the subject. Other speakers in the discussion were Messrs. Webber (Keighley), Stokes (Bexley), Murray (Walthamstow), Wilkinson (Huddersfield), Rayner (Doncaster), Stewart (Rawtenstall), and Furness (Blackpool).

On the adjournment of the morning session, the delegates were entertained at luncheon by the Mayor of Leicester at the Mayor's rooms. It had been expected that Sir Albert Stanley, president of the Board of Trade, would be present, but he was unavoidably detained in London pending the settlement of the railway strike.

In opening the afternoon session the President read a telegram which had been received from Sir Albert Stanley, and which is given in our report. The session was then continued in private to consider the draft constitution of the proposed Industrial Council for the Tramway Industry. As the constitution may have to be further revised, it was thought inadvisable that the draft should be published until ready for submission to members for their final approval.

At the closing session on Friday morning, the report of the Executive Council, which is given in full in the following pages, including the report of the work of the Council in connection with the formation of the Industrial Council, was approved. The election of officers followed. Mr. T. B. Goodyer, general manager of Croydon Corporation Tramways, was elected President with enthusiastic unanimity, and Sir John Courtis, Deputy Mayor of Cardiff and chairman of Cardiff Corporation Tramways, was elected Vice-president. The following were elected to the Executive Council :—Councillor J. Timpson (chairman, Portsmouth Tramways Committee), Mr. A. L. C. Fell (general manager, London County Council Tramways), Mr. J. B. Hamilton (general manager, Leeds City Tramways), Mr. G. W. Holford (general manager, Salford Corporation Tramways), and Mr. R. L. Horsfield (general manager, Walsall Corporation Tramways). Mr. William Clough, general manager, Bury Corporation Tramways, who has recently acted as assistant honorary secretary, was appointed Honorary Secretary.

A pleasing incident of the closing session was the presentation to Mr. C. J. Spencer of a gold watch, accompanied by a fitted dressing bag for Mrs. Spencer, as an expression of the gratitude of the Association for his long service as honorary secretary, a position which he was now resigning as he was taking up an important appointment in London. Mr. J. B. Hamilton, speaking on the invitation of the President, who made the presentation, said that Mr. Spencer had occupied the post of honorary secretary since the meeting in Glasgow in 1911, and paid a high tribute to the work he had done. Alderman Priestley, chairman of the Bradford Corporation Tramways Committee, expressed the warm appreciation of his committee of the services of Mr. Spencer, both as honorary secretary of the Association and as general manager of their tramway undertaking. Other speakers testified to the high regard in which Mr. Spencer is held. Mr. Spencer, in replying, expressed his great regret at severing his connection with the Association ; but the members, by electing him on the motion of the President an honorary member, clearly showed that they did not propose to treat the separation as final. In expressing his appreciation of this honour, Mr. Spencer alluded to the fact that there was only one other honorary member, namely, Mr. John Young, the founder of the Association.

In the following pages a full report is given of the proceedings of what proved to be an interesting and useful meeting.

Digitized by Google

LIST OF DELEGATES PRESENT AT THE ANNUAL MEETING.

Aberdeen ... ... W. Forbes, general manager.

Ashton-under-Lyne ... Alderman R. S. Oldham, chairman.
E. Holt, general manager.

Belfast ... ... Councillor J. M'Donald, vice-chairman.
J. S. D. Moffet, general manager.

Bexley and Dartford... Councillor E. J. Reid, member of committee.
... H. P. Stokes, general manager.

Birkenhead ... C. Clarke, general manager.

Birmingham ... Councillor J. Fryer, vice-chairman.
A. Baker, general manager.

Blackburn ... ... Councillor C. Higham, vice-chairman.
J. H. Cowell, general manager.

Blackpool ... ... Councillor H. Brooks, vice-chairman.
Charles Furness, general manager.

Bolton ... ... Councillor P. Higson, chairman.
Councillor J. W. Keighley, member of committee.
J. Barnard, general manager.

Bradford ... ... Alderman E. Priestley, chairman.
Councillor I. F. Akeroyd, vice-chairman.
Lieut. Sydney Newman.
C. J. Spencer, general manager.
J. W. Dawson, assist. electrical engineer
H. Wheatley, assistant secretary, M.I.A.

Burnley ... ... Councillor E. Heap, chairman.
Councillor D. Irving, vice-chairman.
H. Mozley, general manager.

Burton-on-Trent ... Alderman T. Metcalfe, member of committee.
A. B. Slater, general manager.

Bury ... ... Alderman T. S. Collinge, chairman.
Councillor H. Hargreaves, vice-chairman.
W. Clough, general manager.

Cardiff ... ... Alderman Sir J. W. Courtis, J.P., chairman.
Arthur Ellis, city electrical engineer and manager.

Chester ... ... W. H. Ellis, manager.

Chesterfield ... R. L. Acland, engineer and manager.

Coventry ... ... Councillor H. W. Wale, chairman.
Councillor J. Grant, vice-chairman.
T. R. Whitehead, general manager.

Croydon ... ... Councillor A. A. Thomson, chairman.
T. B. Goodyer, manager.

Darwen ... ... G. A. Newsome, general manager.

Doncaster ... ... E. S. Rayner, general manager.

Dundee ... ... Councillor G. A. Johnston, chairman.
Peter Fisher, general manager.

East Ham ... ... W. C. Ullmann, engineer and manager.

Erith ... ... J. C. Williams, general manager.

Exeter ... ... R. O. Baldwin, general manager.

Glasgow ... ... Councillor Montgomery, chairman.
James Dalrymple, general manager.

Halifax ... ... Alderman A. Fawcett, vice-chairman.
J. W. Galloway, tramways engineer.

Huddersfield ... Councillor E. H. Sellers, chairman.
Councillor T. Canby, vice-chairman.
R. H. Wilkinson, general manager.

Hull ... ... Councillor W. Hakes, chairman.
Councillor C. Raine, vice-chairman.
W. J. McCombe, manager.

Keighley ... ... Councillor A. Smith, chairman.
Councillor J. G. Ambler, vice-chairman.
Harry Webber, general manager.

Leeds ... ... J. B. Hamilton, general manager.
A. Daggett, traffic superintendent.

Leicester ... ... Alderman S. Flint, chairman.
Alderman G. Banton, vice-chairman.
A. F. Lucas, manager and secretary.
T. R. Smith, electrical engineer.
W. Evans, traffic superintendent.
H. Pool, accountant.

London County Council ... ... W. J. Squires, member of Council.
E. W. Morrison-Bell, member of Council.
A. L. C. Fell, general manager.

Lowestoft ... ... H. H. Saunders, general manager.

Maidstone ... ... A. T. Lambert, general manager.

Manchester ... Alderman J. Bowes, chairman.
Alderman A. W. Chapman vice-chairman.
J. M. McElroy, general manager.

Nelson ... ... Councillor W. F. Cooke, chairman.
G. F. Nayler, engineer and manager.

Newcastle-on-Tyne Councillor R. Mayne, chairman.
Councillor G. G. Elliott, member of committee.
Councillor T. Matthewson, member of committee.
Ernest Hatton, engineer and general manager.

Newport ... ... N. J. Young, general manager.

Northampton ... Councillor W. E. Beale, vice-chairman.
J. F. Cameron, general manager.

Nottingham ... Councillor C. Coggan, member of committee.
J. Aldworth, general manager.

Oldham ... ... Councillor Stanbury, vice-chairman.
W. Chamberlain, general manager.

Plymouth ... ... Councillor J. Moon, vice-chairman.
C. R. Everson, general manager.

Portsmouth ... Councillor J. Timpson, chairman.
Alderman R. Payne, vice-chairman.
W. R. Spaven, general manager.

Preston ... ... Alderman J. Ormrod, chairman.
Councillor T. Parkinson, vice-chairman.
J. F. Simpson, engineer and manager.

Rawtenstall ... C. L. E. Stewart, general manager.

Reading ... ... Alderman C. G. Field, chairman.
G. F. Craven, general manager.

Rochdale ... ... Alderman James Taylor, chairman.
Alderman H. Clark, member of committee.
George Webster, general manager.

Rotherham ... H. Jagger, general manager.

Salford ... ... Alderman H. Linsley, chairman.
G. W. Holford, general manager.

Sheffield ... ... Alderman W. C. Fenton, vice-chairman.
Alderman J. Knowles, chairman of the engineering committee.
A. R. Fearnley, general manager.

Southampton ... Alderman F. A. Dunsford, chairman.
Alderman G. J. Tilling, member of committee.

Southport ... ... Councillor Clayton, chairman.
Councillor Richardson, vice-chairman.
T. J. Kendrew, general manager.

South Shields ... Alderman W. G. Wylie, chairman.
J. C. Whiteley, general manager and engineer.

Stalybridge ... Alderman R. Wood, chairman.
Councillor S. C. Homer, vice-chairman.
Frank Schofield, commercial manager.

Stockport ... ... Councillor T. W. Potts, chairman.
Councillor C. Littler, vice-chairman.
A. T. Eardley, general manager.

Sunderland ... Alderman G. New, chairman.
Councillor W. Walker, vice-chairman.
A. R. Dayson, general manager and engineer.

Wallasey ... ... Councillor F. E. Howse, chairman.
R. R. Greene, general manager.

Walsall ... ... Councillor Somerfield, member of committee.
R. L. Horsfield, general manager.

Walthamstow ... Councillor R. G. Woolley, member of committee.
Councillor A. Attwell, chairman of finance committee.
W. Murray, manager.

West Ham ... W. Thorne, M.P., mayor.
Councillor Kensett, chairman.
Lewis Slattery, general manager.

Wigan ... ... Alderman R. T. Fletcher, chairman.
Councillor J. Walkden, vice-chairman.
F. Buckley, general manager.

Wolverhampton ... C. O. Silvers, general manager.

Mr. Sidney F. James, hon. solicitor of the association.

There were also present the following :—

Mr. James Devonshire, chairman of the Tramways (Board of Trade) Committee.

Representing the Tramways and Light Railways Association.

Mr. R. J. Howley, chairman, Tramways and Light Railways Association.

Mr. E. H. Edwardes, general manager of the Lancashire United Tramways Company, Limited.

Digitized by Google

OPENING SESSION.

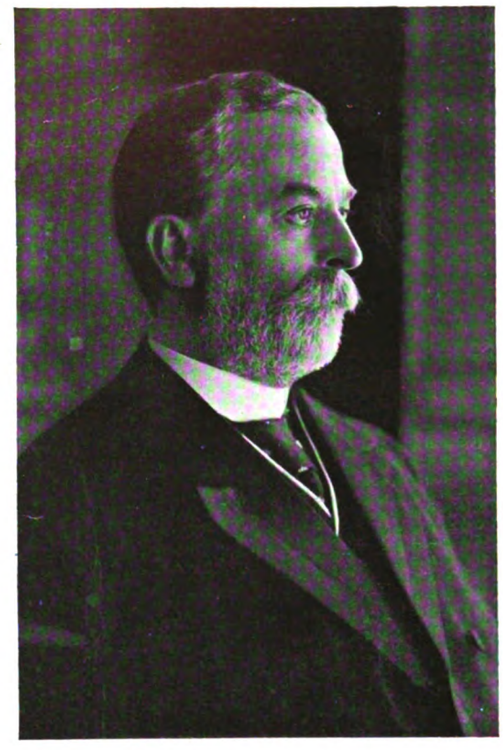
RECEPTION BY THE MAYOR OF LEICESTER.

The seventeenth annual meeting of the Municipal Tramways Association (Incorporated) was opened on Thursday morning, September 26, in the Council Chamber of the Leicester Town Hall, when the members and delegates were received by

His Worship the Mayor (Alderman J. North, J.P.), who said:—Mr. President, ladies and gentlemen, I had no idea that I was likely to meet such a large and imposing body as I see before me this morning. During the period that I have filled the position of Mayor of Leicester it has naturally fallen to my lot—and perhaps to a greater extent during the present year than at any other time in the last four years—to attend conferences which have assembled here for various purposes; but judging from the size and excellent appearance of this Tramways Conference this is the most important of any in connection with which I have had to discharge the pleasant duty which now devolves upon me. I do most gladly avail myself of the opportunity of extending to you a very cordial welcome to our historic borough. What I have to say about your appearance is, I think, to some extent justified by the fact that you have shown good judgment in selecting such an important town as Leicester for your conference. Now I have frequently said that we claim to have the best of everything in Leicester—the best officials and certainly the best committees, and whatever it may be we have the presumption or innate vanity to believe that it is the best, the last word. Now as far as the tramway undertaking is concerned, I am not going to say much. We are very proud of it in Leicester, and the people are quite satisfied; but I know you are such experts in the matter, and so capable of judging of the qualities of a tramway undertaking, that I am quite willing to leave that to speak for itself, with the assurance that you may to some extent share the views we entertain, although perhaps you will not be disposed to give us credit for all the vanity that we take to ourselves. Now it has never been my good fortune to be a member of our Tramways Committee. Perhaps from some points of view I am to be congratulated on that, because I have noticed that the Tramways Committee seem to be possessed of one outstanding weakness, and that is that they have never been able to give something for nothing, although I may tell you that that demand has often been made in Leicester, with a good deal of growling when wages have increased, and the cost of almost everything that is connected with the undertaking is enormously enhanced. The public have been accustomed to get very long rides for a penny, and to have the cars stop almost at their own doors, and everything which comes along to disturb the equilibrium results in the usual resort to the newspapers. There are protests, the committee are condemned, we are told that it is time to scrap it or that a higher authority should take matters into their own hands to get a higher degree of efficiency, that the public service should be the first consideration, and so on and so on. Therefore I frequently feel that I have been a very fortunate man in escaping the Tramways Committee, although that has not been a question of choice, but simply it has happened that circumstances have not made it possible for me to devote my energies to this important undertaking of the Corporation. Still I feel that the fates have been on my side and that there has been a good deal of compensation for any deprivation which I may have suffered through not belonging to that important body. I will say this, however, that the Tramways Committee are never likely to be unduly elated, or to have their vanity flattered by the praise they get either from the members of the Council or from the public in general. Whatever merits they may possess they have to take gratitude generally as unexpressed; and sometimes it is the case that the things about which we think the most and appreciate highest we keep within our own breasts and never express aloud. Now I believe it to be the case, and I think it should be stated on behalf of our Tramway Committee, that we have been excellently served.

I often wonder what we should do in these trying days, these exceptional days of pressure, were it not for the excellent service, for the skill and ability which are evidenced by those permanent officials who have charge of the working of this great undertaking. Were it not for their solicitude for the public convenience I am quite sure that we should feel after all that our grumblings and dissatisfaction that we are so ready to express are as nothing compared with the inconvenience we should suffer were it not for the efforts, the zeal, and the good judgment which are exercised both by the officials and by the Tramway Committee who are responsible for the undertaking. Perhaps at times we fail to realise the ease with which the public are conveyed from one side of the city to the other, and perhaps we overlook really what are the practical advantages of a good and efficient tramway service. I believe tramway systems have had in the past, and possibly will have more in the future, a large share of the credit for the removing of congested areas. I know that a large number of the industrial class of Leicester have thus been enabled to reside in the suburbs, where they have received advantages of health and sanitary convenience which mean so much both to themselves and to the right bringing up of their families—which means so much for the future of our race.

There is only one thought which comes into one's mind, and that is a regret at times that the cost of these advantages which are provided by the ratepayers do not always fall equitably on those who benefit. It is the ratepayers who stand behind any commercial undertaking. I am not going to enlarge upon the vexed question who are the riders who should be conveyed, whether the general public, regardless of their position whether they are ratepayers or otherwise, whether they should pay the net cost of every journey that they take; that is a vexed question. But the local ratepayers have to provide the facilities, or rather I should put it that they have to stand behind the undertaking. If by any chance there should be a loss—possibly there are some here who can call to mind some of the less fortunate towns and cities where the ratepayers have had to subsidise the funds of the local tramways undertaking (that has not been our experience in Leicester, I am glad to say)—that loss would be the ratepayers'. So I have always held myself that all these commercial undertakings should be conducted on strictly economical and business lines. (Hear, hear.) Well, then, we are confronted with this difficulty, that a big city is surrounded by small county authorities whose people enjoy all the advantages that come to property owners and to those outside local communities from the enterprise of the ratepayers generally in the adjoining town, in providing means of travel and so securing an increased rateable value, often to the loss and detriment of the tramway-owning authority. Now I hope the time will come when not only from this point of view but from other considerations also there



The Mayor of Leicester,
Alderman J. NORTH.

will be a more enlightened policy with regard to all these adjacent areas, that they shall be brought within the borough, be subject to one control, and shall participate in all the privileges and pay for all the blessings they enjoy. I believe that such a policy as that would ultimately add to the common good. However, I must not allow myself to drift into these side issues. I can assure you that it is in no perfunctory way, but as an honour and with great heartiness, that I extend to you all a cordial welcome to this town. In doing so, may I express the hope that you will confirm the good opinion that our most zealous citizens could have desired, that your meetings will be both profitable and interesting, and that you will be justified in the wisdom of your choice in coming to Leicester for your 1918 conference. I hope, in conclusion, that before you call your meeting again, in the good providence of God, the dark clouds which now overhang the world will be dispersed, and that we shall have established a permanent and righteous basis for that peace for which we all long. (Loud applause.)

Mr. T. B. Goodyer (general manager, Croydon Corporation Tramways).—I am sure we are all very much indebted to his worship the Mayor for the kind and cordial reception he has given us this morning. Later in the day we shall be partaking of the Mayor's hospitality, when there will be a better opportunity than the present to express our gratitude. I will simply ask you now to join with me in thanking him for his sympathetic words this morning. (Applause.)

The Mayor.—I am extremely obliged to you all, gentlemen.

Digitized by Google

PRESIDENTIAL ADDRESS.

By Alderman S. Flint
(*Chairman, Leicester Corporation Tramways Committee*).

Gentlemen,—Let me in the first place give you a very hearty welcome to Leicester. This is the first time our annual conference has been held here. I trust that the meetings may be interesting and profitable.

Some of you may not know much about Leicester. I may say that it is not of mushroom growth. It is stated on reliable authority that Leicester was founded by King Lear as far back as B.C. 800. There is proof that the Romans planted a military camp here in the centre of the town in the year A.D. 50. Some very fine specimens of old Roman pavement can be seen, and are well worth a visit. Also St. Nicholas Church is built on the site of an old Roman Temple. The great Simon de Montfort, Earl of Leicester, the champion of the people's rights and the father of English Parliaments, lived at the Castle in about the middle of the thirteenth century. The great Cardinal Wolsey died in Leicester Abbey. It was there he uttered those memorable words, "Would I had served my God as I have served my King; He would not thus have cast me off." The old Town Hall still exists where William Shakespeare produced some of his plays.

The town enjoyed the distinction for over 1,000 years of being called a city. I suppose we lost that privilege through having incurred the Royal displeasure. So much for its history.

The principal industries of Leicester are the manufacture of boots and shoes, and all kinds of hosiery. These goods are exported to all parts of the world. Many other trades are carried on, and Leicester may be considered a prosperous town, with a population of a quarter of a million.

The gas, electric, and tramway undertakings and markets are all owned and run by the Corporation. The two electricity stations are controlled by the Tramways Committee. Facilities will be given for a visit to these stations to anyone who may care to go.

Now I must leave local matters and come to subjects of a more general character, and of more practical interest to this conference. My remarks must be chiefly of a retrospective character, as I wish to emphasise the enormous amount of work done by your Executive Council during the past year. I have no hesitation in saying that the work and the strain have been much greater than during any previous period. New problems have sprung up nearly every month. Fresh claims have been made upon us from one quarter or another demanding the special care and attention of your Executive Council and involving considerable labour on the part of the officers.

I should like to make special reference to the burden placed upon your secretaries, first Mr. Fearnley, then upon Mr. Spencer, our present secretary; and here I should like to say that while we congratulate Mr. Spencer on his recent appointment, we shall be exceedingly sorry to lose him as a member of our association, for he has rendered us very valuable services for many years past.

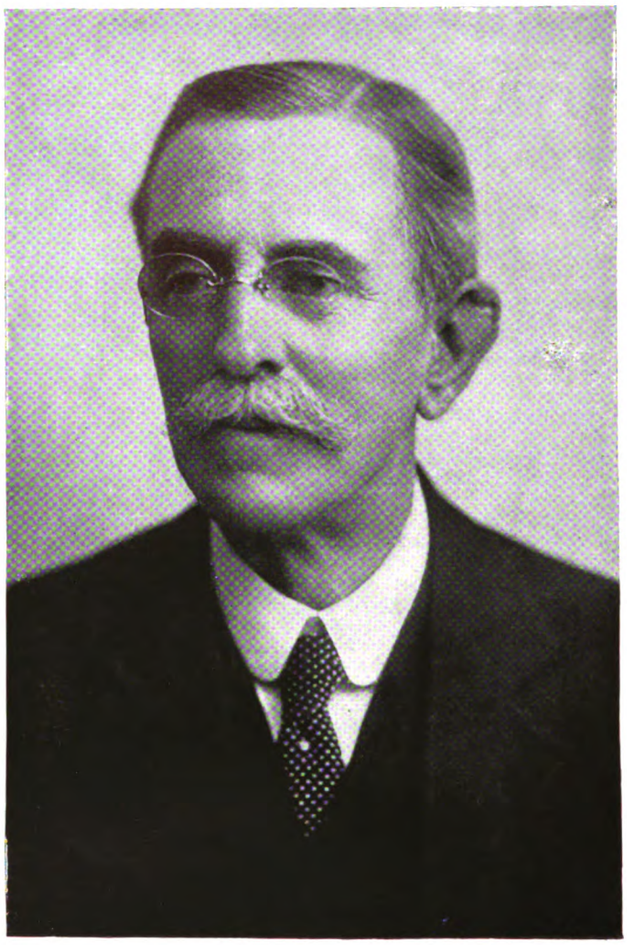
May I say here that the secretarial duties of this association are becoming so numerous and so heavy that unless extra assistance is given I am afraid that no one will be willing to accept the post. I therefore wish to urge that your Executive Council be empowered to make suitable and adequate arrangements for carrying on the work of that office. Mr. Hamilton and Mr. McElroy have also rendered signal service to the association during the year, and I might individualise further, but it is difficult where all have done their best.

I consider that we may congratulate ourselves on the general result of our labours during the year.

I should like now to refer briefly to a few of the more important matters that we have had to consider since our last annual meeting.

The twin questions of coal conservation and electric power supply, and the Parliamentary reports thereon, have raised discussions of immense interest and importance, and will continue to do so in the immediate future. I therefore suggested that Mr. Hatton, of Newcastle, should be requested to read a paper on this subject, and he has kindly consented to do so. He has given much consideration to the matter, and with his experience and ability I am quite sure he will have something very interesting to tell us. Those who have read his pamphlet on the Report of the Coal Conservation Parliamentary Committee will be eager to hear this paper also.

Another matter of considerable importance that has occupied much time and consideration of your Executive Council has been the creation of Joint Industrial Councils as suggested in the Whitley Report. This matter is very much to the front. It is being taken up by nearly all the principal industries in the country, and the Ministers of Labour and Reconstruction are urging its importance. We have had several conferences with the men's representatives, and the outlines of a scheme will be submitted to you for your consideration. The object as set out in the Whitley Report is to improve the relations between employers and employees—a most desirable object both now and after the war.



Alderman S. Flint,
President, Municipal Tramways Association.

The continued advances in wages and all classes of materials have placed heavy burdens on many of our undertakings, necessitating further increases in tramway fares. Those municipalities that have hesitated or refrained from taking action in this respect are in some cases faced with probable deficits when making up their annual accounts. Of course it is disagreeable and always unpopular to increase charges to the public, but in the interests of sound finance it should be done under present conditions, without undue delay, where it can be done.

In many cases it has been found that it could not be done unless the statutory limits were raised or abolished.

You already know that we have had joint conferences with the Tramways and Light Railways Association on this matter. Joint deputations secured interviews with the Board of Trade, with the result that Parliament has given authority to the Board of Trade to raise the statutory limits under certain conditions. Whether these conditions meet the case for our purpose is for this conference to consider and decide.

An application for a further increase of bonus of 12½ per cent. was put in by the National Transport Workers' Federation on behalf of the Amalgamated Association of Tramway and Vehicle Workers. It was an application on behalf of women as well as men. The claim was submitted to the Committee on Production, and after a long hearing, during which the case was put forward elaborately for both sides, the men were awarded 5s. per week increase of bonus, whilst the claim on behalf of the women was not established, and was therefore dismissed.

To our surprise and regret an appeal was made against the award as regards the women, and although this part of the case was fully argued and considered before the award was given, the Committee on Production after further consideration granted the 5s. extra bonus to the women the same as to the men, thus reversing their former decision, in spite of the fact that it was clearly proved that it costs much more to run the cars by women than by men.

Digitized by Google

This raises a very serious question. If one side to an arbitration is allowed to appeal against an award, then the other side may claim the same right, and that may lead to serious results.

In this case also our thanks are especially due to Messrs. McElroy and Spencer for the manner in which they presented our case. We all desire that our employees shall be well paid, otherwise we cannot expect to be well served. We are not out for cheap labour. Compared with other industries we can say that our employees are all in receipt of good wages, and working under good conditions.

Another matter of considerable interest was the appointment of the Tramways (Board of Trade) Committee. To be quite frank, I was not very favourably impressed with this proposal from the first. Perhaps I am over jealous for the freedom of our municipalities from red tape and central control, especially in the management of their trading undertakings. The avowed object for the appointment of this Committee was to assist our undertakings in securing sufficient labour and materials to carry on our work. If that is the chief object, then good only should result from it.

The success of the municipal tramways of this country has been obtained not so much by Government assistance as by local enterprise and effort, and I am rather alarmed when it is proposed to set up other authorities to exercise control over them.

I have referred to various matters that have claimed the attention of your Executive Council during the year more fully perhaps than could be dealt with in the annual report, because I want you to know the extent of its services.

I have no inclination, even if I had the time, to speak at any length of the future, but all the indications are that we shall have to carry on under greater difficulties than any we have yet had to face.

The greatest of all wars still casts its black shadows over us. Besides the difficulties that face us in our public work, most of us have private difficulties and sorrows to meet. While we earnestly pray that peace on a sound and permanent basis may soon be restored to us, let us meanwhile do all we can, individually and collectively, to assist the Government in carrying on the war to a successful issue.

In conclusion, may I again thank you for electing me to the honourable position as President of our Association. My thanks are also due to the other officers and to the members of the Executive Council for their cordial support in the various matters that have come before us; and I trust that in the coming year this association may not only justify its existence, but that its usefulness may be extended in many directions, and that in all our undertakings there may be harmony, co-operation, and respect between employers and employees.

Councillor C. Raine (vice-chairman of the Hull Corporation Tramways Committee).—I have been signally honoured by a request to move a vote of thanks to our esteemed President for his excellent address. It were better had the task fallen into abler hands than mine, but I take the honour as a very great one. Listening to the address, the first thing that occurs to one's mind is the great and ancient town in which we have gathered. I had no idea before hearing the president's address that Leicester could claim such a far away history as it does. While the President rightly claims a good deal of credit for the ancient history of his town I am glad to remember that Leicester, unlike some towns and cities I could name, has not been satisfied to rest on its laurels as an ancient city or township. But I think those who come from what is called the hardy North particularly have looked upon Leicester for a long time as a quite up-to-date, progressive business town. Leicester, with such a long history behind it, has not merely rested on that; but the citizens have been dissatisfied, if I may use that term, and they determined that they would keep themselves up-to-date. They are known and noted for several industries; these have been mentioned in the presidential address. They have other reasons for being notorious in England, but one of them I dare not mention here. (Loud laughter.) Referring now to our work and the more serious part of the day's proceedings, this conference is the seventeenth annual gathering. But I think I can claim, and I think all here will agree with me, that there never has been a conference of tramway representatives at which more important business has had to be considered, where the importance and value of the collective wisdom of the delegates are so much in evidence. As the President has very truly said, and I have had the honour on several occasions lately to foregather with the executive in London, there never was a time in the history of the tramway undertakings of this country when so many and so difficult problems have had to be faced and in some cases overcome. It is not my intention to-day—because, perhaps, we have met for more serious business than that—to dilate upon the presidential address itself; but reference has been made to one subject that I think we ought for one moment to consider, particularly in the light of what has happened this week in the railway world. I am glad the President has drawn particular attention to the position in which we find ourselves after an award that, as he said, was given due consideration. The arguments were put from both sides fairly and fully by our representatives, as they were by the representatives of the men, and to our sorrow and to our regret, after the two parties agreed to abide by the award, we found ourselves in the unfortunate position of having that award reopened by a request from the women. One could have wished, and the wish was expressed most strongly at the executive committee, that we had been strong enough to insist that an award, having been given under proper conditions, should have held good for a reasonable time. Things are shaping just a little better now than they were yesterday. I may also say in passing while we have had many difficult questions to deal with in the past, in my opinion, as in yours, Mr. President, we are not near the end of our troubles. A good many questions of great difficulty are likely to crop up. Without trespassing further on your address, or anticipating any of the discussions, I should like personally to thank you for the able manner in which you have covered the whole ground of the work of the executive on the various problems that had to be dealt with during the year. In the name of the delegates and members present I beg to move that the best thanks of this large gathering be tendered to you for your admirable address. (Applause.)

Mr. Baillie Montgomery (convener of the Glasgow Corporation Tramways Committee).—I have great pleasure in seconding the motion. Councillor Raine has spoken at some length, so I will not say more than that we are all delighted with your address, which will be a great stimulus to us in our proceedings during the conference. (Hear, hear.)

The motion was carried with acclamation.

The PRESIDENT.—I thank you, gentlemen, for the very kind vote you have just passed.

SOME NOTES AND CONSIDERATIONS ON THE POST WAR POSITION OF ELECTRIC POWER SUPPLY.

By ERNEST HATTON.

(Engineer and General Manager, Newcastle Corporation Tramways.)

Entering so closely as it does into the daily life of the majority either in domestic requirements, industries, or travelling facilities, the production and distribution of electric power calls for the most careful consideration of the public.

In its inception electricity was primarily regarded as an illuminant, and not until the advent of street traction did it make much headway on a large scale in this country. From this period, however, round about 1900 it made rapid strides as a motive power, due largely to the fact that now for the first time production on a large scale with correspondingly reduced costs brought it within the field of competition with other well-established sources of motive power. The power companies in the North-East Coast area are amongst the foremost in rapid development, due to the exceptional facilities in this area and wide range of action in their operations.

Municipalities, however, not enjoying these advantages were compelled to adopt a more cautious policy in the expenditure of the ratepayers' money. In addition their efforts were regarded by many as encroaching on private enterprise, and in a measure this also had a retarding effect. This view is now fortunately changing. The limitation of local areas also was too restricted, and in the event of a local authority desiring to break the bounds, local feeling was invariably created which as a rule could only be appeased by concessions in some form or another, thus adding to the costs of power production and generally retarding the sale of electric power in keen competition with other sources of mechanical energy.

This great war, however, has caused searching investigations into the policy and methods in vogue in this and other countries with results not flattering to those who have hitherto guided our destinies or to the enterprise of ourselves generally, and now we all appear to be seized with a strong desire to put the industries of the country upon a proper basis. Let us hope that we do not cool off in our endeavours when times are more peaceful, and give way to a strong desire to slow down after the strenuous times we are now living through and again adopt the policy of letting "well" alone.

These investigations into our past efforts have produced two reports on electric power production, which, whilst condemning us for our apathy, contain many valuable suggestions. It would, however, have shown a better spirit if some of the insinuations regarding the past efforts of municipalities had been omitted altogether, and it would also have ensured a better reception for these reports. Another objection to these reports is that implied benefits that will be derived from their complete adoption appear too rosy, and has the effect of inducing many estimable people without sufficient technical knowledge into believing that they are about to receive something for nothing or electric power at impossible figures, for the present at any rate.

Now electric power and most other commodities can be produced very cheaply in large quantities with proper facilities in most large commercial centres in this country, but after production must be taken or distributed to consumers requiring a supply, and it is in the economical distribution of such commodities or keeping middlemen's profits within reasonable limits, which ultimately determines

Digitized by Google

the price of any article (leaving out of consideration dumping policies, to which electric power supply does not lend itself). The cost of electricity as between producer and user is therefore largely influenced by the charges on capital outlay in bringing the product or supply to the user. In our large cities the costs incurred in taking up and relaying street works is a very heavy item of expenditure, and after all we must not forget that streets are made primarily for the use of the public and transport services, and must therefore be constructed and maintained with this end in view, and whilst from lack of foresight in not laying mains of a greater capacity in the early stages of development, and thus saving expenditure on street works at later periods, one has at the same time to keep in mind the annual charges from too venturesome a policy in this direction.

In the future laying out of trunk roadways, when possible space should be left at the sides to accommodate electric cables, etc., and arranged so that the cost of taking up and relaying would not be expensive. These spaces could in many cases be made ornamental and pleasing to the eye at small cost to the community.

The policy pursued in most towns in this country has been to have one authority responsible for production of electric power for general commercial uses, light, and traction supply, and it is alleged by some critics on the subject that the traction supply has been overcharged to support the sale of power to other users at lower charges than were warranted by the circumstances at the expense of the traction authority.

With certain exceptions I think this argument can be conceded, as without the traction demand, certainly in the early stages, the power production in some cases would have cut a poor figure, but looking at the subject from a wider view, where the local authority is the owner of power supply and traction, and where the surplus profits, if any, go into a common fund, is there any reason or argument against the one helping the other, at any rate in the initial developments, for in almost every case of traction in the early stages, when working costs were very much less than such figures reached in 1914, the traction scheme was invariably a paying proposition.

Now if that traction authority had produced its own power, it would as a rule have obtained its supply at a less inclusive cost than purchasing it from some other committee, the result being that the surplus profits of the tramway would have been greater (it must be granted that there were few traction schemes in the early stages that did not make surplus profits). There would therefore have arisen demands for still further reductions in fares and other concessions, and with the continual increase in the costs of operation a point would have been reached earlier when the fares would materially have had to be increased or the upkeep of the undertaking neglected. At the same time the adoption of the separate policy of power production would have left the Electric Supply Committee struggling to make ends meet if at all, with unfortunate results in many cases. By a combined policy, however, where municipally owned this stage has been in most cases safely passed with benefit to the community of that town.

It, however, must not be overlooked that the separate policy of some tramways owning and producing their own power did stimulate the desire and efforts of the advocates of the combined policy to produce power at lower costs; hence the policy of competition in all matters affecting public life must not be lost sight of when considering the ultimate welfare of a country.

Having dealt generally with the power supply up to the present time, we now come to the proposals in the two reports formerly mentioned. These reports insinuate that we have only in the past been dealing with the subject in a playful mood, and that if we do not now alter our methods we shall be hopelessly left behind by other nations. Criticism, however, on our past conduct does not get rid of our annual charges on existing undertakings, and these charges, coupled with the new annual charges on capital account on the proposals in these reports, will ultimately be the measure of our future success and charges for electric power, reduced of course in proportion by the influence that increased output will have if these schemes are developed. At present, however, this is an unknown quantity, but must subsequently be very great. Even then, however, we must bear in mind that wages and everything which counts in the production of electric power, will for many years be a determining factor upon cheap power supply, so that in some cases it may, even under the most favourable circumstances, be some time before we again get inclusive prices per unit which will compare with the charges made in 1914, but in the years to come if the schemes, or some modification of them as outlined in the reports, are adopted, it must ultimately lead to a general reduction in charges to the great benefit of the country.

I have been regarded by some technical journals as a reactionary because I dare differ with some of the suggestions outlined in the reports referred to. In many respects I think there are better ideas formulated in the first report than in the second. They are certainly more original, and have greater possibilities. What I deprecate is the too rosy view put forward in matters of this kind, leading even estimable people to believe that within a few weeks at most they will have a power supply at extraordinary cheap prices, and even if you try to convince them that it is not so, they mark you at once as a reactionary.

Any scheme worthy of support (and these schemes are) should never require puffing. Sane argument alone, without trimmings, is the factor which always appeals to the intelligent.

Now any scheme of general power supply if it is to be a success must within a reasonable period, by its more economical working and production on a large scale, be able to carry on its back the annual charges upon the plant which will be superseded or closed down by its adoption, and it seems to me that much of the plant which will be superseded in some areas under the proposed schemes could well be transferred to areas with lesser immediate demands, and be in the meantime used with advantage, or suitably disposed of, leading to great capital saving and consequently lower annual charges upon the accounts, and the subject therefore in the first instance requires an impartial survey of the proposed areas, the plant requirements for the area, and the best use some of the existing plant (which must make way for plant of greater capacity) can be put to in order that the new capital charges can be kept within reasonable limits. Where demands are heavy, of course, the existing plant will have to be kept in commission until the larger and more efficient plant decided upon for the several areas can be brought into operation, and therefore these matters should be decided without delay, and a programme for each area could then be settled, and with a clearing house for making the best use of existing plant superseded under these schemes the greatest economy in capital expenditure would be obtained.

It is important to remember that with the introduction of electric traction in this country the ability of the new system to carry on its back existing expenditure on horse traction was a vital factor, and when it was clearly demonstrated by results that electric traction could carry the existing capital charges of the obsolete horse traction out of the additional revenue and profits from its operation, the electrification of tramways forged ahead with results now well known to us, and I believe with care and foresight in development the establishment of a general electric power supply on a large scale will have the same beneficial results.

Overlying, however, all the foregoing there is the policy to be pursued by the controlling authorities with regard to the railways of this country, for if the authorities have, or are about to decide, upon the electrification of the railways of this country after full consideration of all national requirements—if this course is eventually to be adopted, then the whole policy of the country with regard to electric supply will require to be treated from a wider standpoint altogether. Now obviously if this is the intention and future policy of the country, commencing with the electrification of the branch lines or local railway services in populous areas, and the more general electrification policy following on this, then it is apparent the existing stations with their plant, whilst no doubt suitable for ordinary commercial purposes, would not, either in plant capacity of their existing units or general location of the station in many cases, be suitable for the larger purposes under review.

Following on the above, take the case of an isolated town with its own power station working economically according to its present demands, say located on the main line of any of our principal railways, should that main line of railway subsequently be electrified, then rarely would it be advantageous to extend the small local power station to meet the larger demands unless it was most favourably situated in regard to the essentials for cheap power production on a large scale, but generally we should find the most advantageous way of dealing with such a case would be to shut down this small local station as a generating centre, and to make it a sub-station of the greater electric supply to the railway system passing through the town. It is therefore vital to deal with this subject in its broadest and truest sense that some declaration should be made by the authorities at the earliest possible moment, as it would undoubtedly allay many conjectures and cause a concentration of thought upon the whole problem from a national point of view with beneficial results, inasmuch as it would allay the local jealousies of each municipality desiring to grab a super power-station within its own area, as they would quickly realise there are only certain places where such stations or groups of stations can be economically located, and that is where the chief essentials for cheap power production on a large scale are situated to yield the greatest economies to that area, all things taken into consideration.

Once the foregoing main principles are decided upon all other considerations will follow as a natural consequence.

If the railways are electrified then it will bring power supplies into almost every area in this country, since it is so well served by railways, with great advantages in the future to street and road traction services, etc. Some areas, due to their possession of the essentials and location, will be able to produce power at lower costs than other areas not possessing these great advantages, and it is a matter which should receive the closest attention of the authorities as to whether standard rates and charges should eventually be set up; in other words, should a universal rate be adopted or differential rates in areas? In the event of differential rates the tendency will be in the future for intense development in some areas where undertakings will gravitate to those areas supplying power at the cheapest

Digitized by Google

rates, whereas I am of the opinion that general development all over the country should be encouraged instead of intensive developments in some areas. This would ultimately give the greatest benefit to the population, especially with regard to housing, etc., and food supplies.

If the controlling authorities are satisfied that the electrification of the railway systems of the country is desirable, then this policy will lend itself to the most active and advantageous method of setting up a general power supply all over the country, touching as the railways do almost all centres of population and industry within reasonable distances, and as a rule providing the shortest routes and cheapest opportunity of laying main trunk supply cables.

Again, some areas will have the advantage of waste heat from certain manufactures and processes, and where possible the erection of such works having a surplus of waste heat which could advantageously be used in the generation of power, should be encouraged in areas not now enjoying these advantages. This is a matter that may require the parental control of the Government of the day, which, with the experience gained in the past few years, should enable them to give practical advice and assistance in this direction.

Where possible the more general setting up of the main industries of the country over larger areas the less would be spent in railway rates by transit from one area to another on partly finished goods, and if the raw manufactures of an area could finally be finished in that area, then transit from inland places to seaboard on finished products is not a serious handicap. All charges on unfinished goods from one part of the country to another for final manufacture does add to the price of the articles when finished. These considerations

Mr. Ernest Hatton.

have also a great bearing upon the production of cheap power, and the above conditions should be aimed at within reasonable limits.

I am of the opinion, having in mind the existing electric power developments of the North East Coast, that an area embracing the North Riding of Yorkshire and the counties of Northumberland and Durham should be chosen, in the first instance, for a practical demonstration of the policy of general power supply operating over a large area under one authority, and the experience gained thereby would be of the greatest benefit to other areas of the country.

The constitution of the Power Boards set up in the areas should in every case have a majority control of public representatives elected by the area, together with the representatives of large consumers.

All generating stations in the area, together with the main transmission system of the area, including the power supply to railways and all public bodies, should be under control of the Board, but those localities or towns where preference is in favour of local distribution should, in the first instance, be allowed to act in that capacity only, but in any case the power generation and supply mains must for obvious reasons be under the complete control of the Power Board.

There will, of course, as in all matters, be certain exceptions where the proposed taking over of some existing power-stations will point to no further economies from such procedure, and in these cases special consideration should be given.

All the foregoing desires and aims must take time to accomplish, but their adoption should ultimately lead to the greatest good of the community. In the meantime, however, we will have to do our best with the existing conditions to meet the competition in the world's manufactures, but no time should be lost by the controlling authorities in deciding a policy, so that an embracing programme could be drawn up with reasonable chances of being carried out in the immediate future, and thus put the whole country and not a part of it only in the position to withstand the severest competition which must follow the post-war period of heavy demands in most trades and industries, whilst good prices will be the rule, and we should then at the end of the trade boom be in a better position when prices fall of holding our own with the manufactures of other countries.

DISCUSSION.

Mr. J. M. McElroy (general manager, Manchester Corporation Tramways).—If any excuse were needed as to why this Association should interest itself in the future of the electric power supply of this country—a matter which is being fully considered by other kindred associations, particularly by the I.M.E.A.—it is only necessary to state that we are vitally concerned as regards the proposals which are now receiving the Government's consideration because at least 25 per cent. of the total output of the power-stations in the United Kingdom is used for tramway purposes. It cannot therefore be considered out of place if at the outset we approach this subject as an industry which provides our friends, the central station engineers, with the largest (and, shall I say, the best paying ?) class of customers they have got. There are 176 tramway undertakings in the United Kingdom—93 municipal undertakings and 83 company undertakings. These undertakings are using about 620,000,000 units per annum, which, as I have already stated, is rather more than one-fourth of the total output of the United Kingdom for all purposes. Of the total consumption for tramway purposes 79 per cent. is used by the municipal undertakings and 21 per cent. by company undertakings. Now, some tramway systems have their own power-stations, and it may be interesting to compare the number of such undertakings with the number which take their energy from combined stations. Out of the 176 tramway undertakings, 38 have their own power-stations and 138 purchase their energy. This does not give a true relative figure, because I find that, when looked at from the point of view of consumption, 50 per cent. of the total consumption for tramway purposes is generated by those undertakings which supply their own power, and 50 per cent. is purchased from combined stations. In this connection, however, it must be remembered that those undertakings generating their own supply include the London County Council. If the London County Council were excluded, it would alter the figures to the following, namely, those taking supplies from combined stations, 61 per cent., and those supplying their own power, 39 per cent. The question as to whether tramways were justified in providing their own power-stations was discussed *ad nauseam* in the old days. At this stage we need not go over the old arguments ; but we must admit that the whole situation and outlook has altered since the days when the controversy on this subject was at its height. On theoretical grounds it was argued by many central station engineers and others that, by taking supplies from combined stations, tramways could be more cheaply supplied than by installing their own power-stations. But broadly speaking, actual experience in the past has not justified these predictions. I am voicing the opinions of many tramway managers in saying that in certain towns the tramway authorities have been called upon in the past to pay prices which could not be justified when compared with the prices charged for energy supplied for industrial purposes, having regard to the relative load factors. In this connection it will be remembered that in the year 1911 the two associations, the I.M.E.A. and the M.T.A., prepared jointly a scheme settling the principles upon which the charges for traction supplies from combined stations should be based. I have just sent out a query to all the municipal undertakings with a view of ascertaining how many have had the price fixed in accordance with this basis, and I find that practically none of the towns has adopted the scheme. This is significant, and it would be interesting to know why. Mr. Hatton asks if there is any reason or argument why the traction side of the business should not help the power side in cases where the surplus profits go into a common fund. There is a strong suspicion among tramway managers, fairly well founded, I fear, in some instances, that in order to develop the power supply side of the business exceedingly low prices have been charged to power consumers which would not have been possible had it not been for the high prices the tramways have been called upon to pay. A cheap supply of electrical energy for power purposes is all-important in the national interests. But to develop our industries by the supply of cheap power obtained at the expense of the millions of workers who use the tramways is a form of taxation which is altogether wrong in principle. In thus drawing attention to the relations which have existed in the past as between power supplies for industrial purposes and supplies for traction, I may be charged with taking a narrow view of the situation, and having a limited outlook at a time when a " hill-top " view is necessary if the supply of electrical energy for industrial purposes is to be developed along proper lines in the national interest. This charge, if made, will not be justified. I am out for the development of the power supply in a way which wlll benefit all industries, including tramways ; and in this connection I welcome the two valuable reports which have

Digitized by Google

been issued on the electric power supply of the country. The first report was made by the Coal Conservation Sub-Committee. Many points in the report are no doubt open to criticism, but its main conclusions are worthy of favourable consideration. It advocates the appointment by the Government of a Board of Electricity Commissioners with full powers to direct the development of the electric power supply throughout the country. These Commissioners, the report suggests, should have power, *inter alia*,

1. To stop the extension or multiplication of uneconomical stations for public supply.

2. To arrange for the handing over on equitable terms of the generation, transmission, and main distribution systems in each of the areas into which (the report suggests) the country should be divided, to a new electricity body appointed for that area.

3. To standardise for each area the frequency and voltage of the main transmission and distribution system.

When the report was presented to Parliament, it was prefaced by the following note of the Minister of Reconstruction :—"It will be observed that important issues affecting municipalities and public bodies are raised in the report. They will be explored in all respects by the Government before any action is proposed to Parliament upon the subject. In its legislative aspects the whole matter is being investigated by a committee appointed by the Board of Trade and presided over by Sir A. Williamson, Bart., M.P."

The report of the Board of Trade Electric Power Supply Committee is dated April 29, 1918. I don't know whether all the members of this Association have read this valuable report, but I think it would not be out of place for me to read the final recommendations which were unanimously adopted by the members of the committee. They were as follows :—

(*a*) That a new body to be called the Electricity Commissioners should be set up, to whom should be transferred the existing powers of the Board of Trade, Local Government Board, Local Government Board for Ireland, and Scottish Office, relating to the supply of electricity, and to whom large additional powers should be given for regulating and encouraging the generation and distribution of electricity.

(*b*) That the Electricity Commissioners should, subject to an appeal to Parliament, in certain cases have general control over the generation and distribution of electricity in the United Kingdom.

(*c*) That the existing system under which electricity is separately generated for small areas should be abolished.

(*d*) That the Electricity Commissioners should, after local inquiries, divide the United Kingdom into districts technically suitable for the economical generation and distribution of electricity.

(*e*) That in each electrical district a District Electricity Board should be set up which should purchase all generating stations of authorised distributors, whether local authorities, companies, or power companies.

(*f*) That the District Electricity Board should be responsible, by themselves or their lessees, for the future generation of electricity in their district, and for the establishment of new generating stations and proper systems for the main transmission of electricity in their district.

(*g*) That existing electrical undertakers should, if they so desire, retain their power of distributing electricity within their local areas, but should purchase electricity in bulk from the District Electricity Boards or their lessees, due provisions being made for controlling the profits of distributors so as to ensure a cheap supply of electricity to consumers.

(*h*) That District Electricity Boards should make no divisible profits.

(*i*) That District Electricity Boards should be financed, in whole or in part, by funds raised with Government assistance, except where it is shown to be desirable and practicable to finance the Boards locally.

I may be excused if I read one or two paragraphs from the Committee's report :—

> "There are to-day about 600 bodies generating electricity for public purposes, apart from the large number of manufacturers, collieries, and others generating their own power. We have no doubt that these separate stations can be reduced to a relatively small number in the course of time, and that the country will greatly benefit thereby. Past and present conditions have encouraged manufacturers to set up small independent installations, in the belief that it is cheaper to generate electricity themselves than to buy it from existing public electricity undertakings. Most of these independent small plants involve an unnecessary expenditure of capital and comparative waste of fuel and labour. The parochial system of generation and distribution should give place to more economical methods, involving wider areas of distribution and the combination of diverse kinds of industry in order to obtain the fullest use of larger generating plant. It may be laid down as an axiom that, in order to ensure a cheap supply of electric power for all consumers in industrial districts, all should unite in taking their supply from a common system."

Again, take another clause illustrating the lack of centralised control :—

> 13. "Owing to the chaos of different systems, and the absence of any attempt to standardise pressures and frequencies, co-operation between neighbouring authorities is difficult and expensive. In London, for example, there are seven railway and tramway systems which generate electricity for the purposes of traction at differing frequencies—one at 50, two at 33⅓, and four at 25—thus rendering exchange of electricity between them impracticable except at the great expense involved in converting it. Again, there are in the area of Greater London 70 authorities who supply electricity to the public, and own some 70 generating stations, with 50 different types of system, 10 different frequencies, and 24 different voltages."

The main proposals of the committee, namely, first the setting up of a national authority for directing the general development of electric power supply throughout the country; secondly, the setting up of District Boards for wide areas to deal with all generation of electrical energy within such areas, are, I think, sound principles which those best qualified to judge will not dispute. The details of the scheme will have to be carefully considered when we see exactly what steps Parliament proposes to take to give effect to the committee's recommendations. Particularly shall we have to consider the financial side of the proposals, and the question as to who will be eligible for appointment on the District Boards. Something will have to be done—and done quickly—to deal with the present unsatisfactory position of the electric supply industry and to direct its future development. To continue the present wasteful condition of affairs is against the national interests, and if we are to keep our end up in competition with foreign countries a cheap supply of power is of the greatest importance, and the development of the power supply, if we are to get the best results, should be directed nationally and not from the point of view of the "parish pump."

Mr. H. Webber (general manager and electrical engineer, Keighley Corporation Tramways).—I quite agree with the remarks of the two gentlemen who have introduced this subject to the conference, but I do not know that we can anticipate any results in the immediate future. There is no doubt that all existing undertakings have suffered from the standing charges which developed as they grew up owing to the rapid change in the method of dealing with electrical energy in various phases, and this new scheme is going to be burdened with a tremendous capital expenditure. It will not only have to compensate local authorities for their generating plant in existence now, but the promoters will have new stations to put down, and there will be a tremendous length of either underground or overhead feeder cables. Moreover, there is the moot point as to whether the transmission losses will not almost equalise the transit of coal by railways. If that is so, the great advantage of having the main generating station near a colliery will be almost counteracted. We all know that the North-East Coast for some time has had a big power company developing on lines very similar to those proposed in these schemes. I do not think they can supply electrical energy much cheaper than we are supplying it at Keighley. For some considerable time before the war our average price was ½d. per unit; and it has been proved with a station comprising 6,000 kilowatt single units, well situated and run economically, that a large station is not going to be much improvement on steam consumption, although the saving of labour may be considerable. Another point is that, if there is a big breakdown in one of these super-stations, you will certainly have more serious results than with present conditions, where the supply is split up in a number of smaller stations. That will be a consideration that will have to be borne in mind. They will have to duplicate their trunk feeders, probably two or three times, to avoid what might be almost a national calamity. I believe that in the long run the scheme would develop into a satisfactory working organisation for the benefit of the community, but I do not think they should rush it. It almost amounts to requiring a Ministry to deal with this matter when it gets on to its feet. I do not think the scheme as put forward is large enough or comprehensive enough to deal with what it will develop into. If trunk cables are going to be run alongside the whole of the railways, and the railway system of this country electrified, the business will be a tremendous one. I had a considerable experience on the North-East Coast before I went to Keighley, and know what the Newcastle Power Company have done in that district, but they have not been able to sell power at exceptionally cheap rates; not much cheaper than we have managed to do at Keighley, although, of course, we are pretty well placed for coal, well placed for water, and the town has about 30,000 to 40,000 horse-power in a compact little area. So that it will be a moot point, taking a case like it, whether they could shut our generating plant down and do better by giving us a bulk supply from perhaps 20 or 30 miles distant.

Mr. H. P. Stokes (general manager, Bexley Council Tramways.—This matter which we have under discussion is one which I am afraid is rather likely to get into local narrow circles, yet it should be looked upon entirely in its broad outlook from the national point of view. The principal point which we have to consider,

Digitized by Google

and which I take it the Government is considering at the present time, is the utilisation of the resources of our mineral wealth, and this paper deals with it primarily as far as coal is concerned. Generally speaking, engineers, in looking upon the proposals put forward, still do so with a narrow and prejudiced outlook, thinking only of our present ancient methods which fail to utilise the most valuable elements in these resources. We must look upon the whole subject from the point of view that coal has been most extravagantly and wastefully used, although it is a material which should be dealt with as the most valuable asset which the nation possesses. Coal must be used in a very much more economical way than it has ever been used or can be used with our present methods of converting it through steam into electricity. We should go forward first of all on the lines of utilising the coal itself to its utmost advantage, first taking from it all the valuable properties it contains, and eventually arriving at that stage when the residual can be turned into electricity and looked upon as a cheap by-product which can then be almost given away. Now there is one other feature connected with the electrical side of the business of which I think we ought to be a little suspicious. We are too apt nowadays to think of everything in standardised form. We have standard ships, standard clothing, standard boots; there is an absolute mania of standardising everything at the present time. Now, electrical energy, as it is used in various industries to-day, cannot be confined absolutely to one particular form. It can be utilised in many different ways, and each of these different forms of energy in themselves represent peculiar advantages for certain processes. It seems to me instead of adopting an absolute standard throughout the whole of the country, it might be advisable, at any rate it is worth considering, as to whether some special standards might not be set up in certain areas. But in arriving at standardisation you can consider it on broad lines, though not too binding. Take, for instance, railways and tramways, the ordinary transport services. You could have a standard form in connection with them, standard pressures for light, but you must also go on and have other standard forms for dealing with peculiar phases in industry. And so to begin with, one standard which is to be applied willy-nilly throughout the whole business, I venture to suggest, would be a somewhat wrong line to go upon. Standardise by all means, but at the same time let your standardisation be sub-divided to a certain extent in order to meet all the national requirements without fettering scientific progress. I have read both these reports, and although one can always criticise individual paragraphs, I think we should look upon it more from the broad standard as to whether it is in the national interest or not. I must say that I agree with Mr. Hatton himself, as the first report appeared to me to deal with this on its prime basis, that is the question of coal; but even that in my opinion somewhat misses what I look upon as the most vital point in connection with the whole business—the utilisation of coal for all it is worth first, and letting electrical energy be one of the side issues which emanate from the good utilisation of that invaluable material. (Applause.)

Mr. W. Murray (manager of the Walthamstow Tramways).—I hesitate to intervene in this discussion because I have not got the necessary technical knowledge to judge properly of the engineering problem introduced in the scheme. But I take for granted what I have heard as the general consensus of opinion of electrical engineers, i.e., that, so far as the engineering point of view is concerned, the scheme is a desirable one and a good one. With regard to the financial aspect, I think it is more open to criticism; and there are some points in the Board of Trade Committee's report to which I should like to refer. I shall not elaborate them, but merely mention them in the hope that some other speakers who have technical knowledge of the subject may give us some further information or some guidance. Of course this matter is of prime importance; but at the same time we want to see before this national scheme is launched that it has at least a fair prospect of success. In reading through the committee's report the first thing that strikes me is this, that the whole success or non-success of this scheme depends on what is done with the present generating stations once they are taken over. Are they to be scrapped? Because, if so, the new scheme is going to be handicapped with an enormous burden of debt which I think will go a long way to prevent it being possible to supply electricity at a low figure and avoid a serious financial loss. Of course I know that Section 31 of the report suggests that the present stations are to be continued, that they should be linked up and run so long as they can be run efficiently and economically. But later sections in the same report seem to avoid this point, and to indicate that there is an intention at once to set up these super-stations, and to scrap existing generating plants. Now, as I have said, I think that the failure or the success of the scheme depends upon the policy adopted. If the Government act wisely in launching the scheme, then there is a reasonable chance for its success; if they act mistakenly I think grave financial disaster is sure to follow. Now a point has been raised by a gentleman on my left which had already struck me as a comparative outsider, i.e., the saving effected in generation—is there not a danger of its being lost in the increased cost of distribution? In London, and I presume in all great cities, there is the costliness of laying mains. The difficulties in dealing with an intricate network of gas mains, water mains, telephone cables, and other things makes the expense of main-laying exceedingly great, and then the reinstatement of the roadway comes on top of that. I should like to hear the opinion of some technical expert whether there is not a possibility of the gain at one end of the question being lost at the other. Then if a loss is made, who has got to bear that loss? This report of the Board of Trade Committee makes no reference or suggestion in regard to that. I am inclined to think, so far as I have heard from engineering experts, that they certainly consider that for a few years a loss is a possibility, and perhaps a very probable thing to have to face; and the question is, if a loss is so incurred who is going to make it good? In that matter we get no guidance from the report whatever. Then there is another point, the question of the exemption of private stations. Clause 42 says that a private station or a station used for the owners' use and not for the sale of electricity shall be exempt, and yet the report itself recommends the taking over of tramway stations and railway generating stations, and leaves the stations belonging to private individuals and other manufacturing companies severely alone. So that a municipality owning its own tramway station, used for nothing else but tramways, has got to part with it no matter how successful, no matter how efficient, whereas a private manufacturing company can hold on, and can build others without restraint. I think that clause is altogether objectionable. Then there is another point about the charges are they to be uniform or varied? Is a works put down in a thinly populated district to charge more than one put down in a great centre of population? This is a very grave matter and requires consideration. These are the big things, but there are one or two little things that ought not to be lost sight of. There is the question of the appointment of the Electricity Commissioners. It is proposed to appoint five, three of them to be paid salaries of not less than £3,000 per annum, and suitable arrangements made for pensions. The other two are presumably men in a lower category, and will get less. It is further suggested that the appointment of these Commissioners should be left absolutely in the hands of the President of the Board of Trade. Now, sir, I do not think that that is a good arrangement. I am inclined to think that some gentlemen sitting around this table will agree with me in thinking of past appointments, that there ought to be some consideration for the President of the Board of Trade. (Laughter.) There is another point I rather take exception to. Section 51 urges that the District Boards should be *small Boards*. Why? One is apt to be suspicious, and there is a reason for it. I venture to think that there would be greater safety in greater numbers, and that it should not be possible for a party of two or three gentlemen to capture, by any possible means, these District Boards. Then, finally, there is one other point. The report suggests that the Commissioners or the District Boards may compensate engineers and other officials who are displaced by the new scheme. I think it is grossly unfair that the word "may" should be used. Compensation should be made compulsory. Any man displaced by the change ought to be compensated for the loss of his position. I do not think our two hours' meeting is of much practical use for discussing this report. It will demand a long series of meetings, and every section should be taken up individually and considered in all its bearings before the thing goes forward. Fortunately the Bill has not yet been drafted; certainly it has not been circulated. We are more or less in the dark as to what is going to be put forward, and I hope before anything becomes law there will be earnest and serious consideration of all these matters. Otherwise we may take on something so big that we do not realise its bearings in all directions, and perhaps be saddled with a white elephant such as we have been saddled with before in these great undertakings, and suffer for it afterwards.

Mr. R. H. Wilkinson (general manager and engineer, Huddersfield Corporation Tramways).—I would like to thank Mr. Hatton for his very estimable paper. I believe that it will result in a great deal of good to tramways and all other consumers of electricity. But, as representing a town which has its own power-station for generating electricity for tramway purposes, I would like to point out what I believe many towns have missed. When Huddersfield were considering the adoption of electric tramways they carefully considered the electric power supply, and if they had not adopted their own station they would have had to pay at that time something in the neighbourhood of 3d. per unit for a supply of electricity. They erected their own power-station, very wisely I think, and the cost of generating electricity did not reach ¾d. per unit, and is in the neighbourhood of that figure to-day. I can safely say that if we had not had our own electricity station at Huddersfield the tramway system would have been very much smaller than it is to-day. We serve a population of 160,000, have 56 miles of track, and earn £170,000 per annum, with excellent results financially. So you will see how cheaply we must be working, and the foundation of that success I attribute to having our own power-station.

Mr. E. S. Rayner (manager and electrical engineer, Doncaster Corporation Tramways).—I also should like to thank Mr. Hatton for his paper. I enjoyed reading it as I enjoyed reading his report to the Newcastle Corporation on the proposals of the Committee

Digitized by Google

of Electric Supply. I take it, from some of the remarks in this paper and the remarks which he made in that report, his opinions on the scheme have altered somewhat. The whole question resolves itself into whether, for the supply from the stations which are going to be taken over, there is to be substituted a cheaper supply. It seems to me that no generating station, however large, or small, should be taken over unless there is a guarantee that the town or district concerned receives in return a cheaper supply of electricity. Because, when all is said and done, it is only a question of price and profit. The bogey of the scheme as I see it is the question of Government control. Have the various things that have been taken over and controlled by the Government shown by their management, since they have been so controlled, that they have been more economically and efficiently managed. I think in some cases that is open to question. If we take, for instance, the telephones. The telephone companies were not all that could be desired ; but at any rate they were satisfactory undertakings when you consider that they had to pay a large royalty to the Government and in addition managed to pay a dividend to their shareholders. Under Government control prices have gone up, and I believe that the telephone system is now worked at a loss. Now if the Government are going to take over and control the electricity supply, we surely ought to have some very clear guarantee that the prices at which electricity is to be sold to the smaller undertakings will be less than the cost of generation by them. Ours is a small undertaking, and I really do not mind from a sentimental point of view, whether the station I manage is taken over by the Government or not. If I am to receive a cheaper supply I am quite prepared. But I do feel rather dubious about handing over absolute powers to a Board which starts out with the fixed idea of making a clean sweep. They say we will have super-stations, and I am of the opinion that there is a great danger in a department coming in with certain fixed ideas of washing out everything at present existing, and putting in super-stations regardless of cost, regardless of the millstone of capital expenditure. I think some adequate safeguards are essential, so that the final result shall be cheaper electricity. Where capital charges bear such a very large proportion to the actual cost of the supply of electricity—not the cost of generating—these points must not be lost sight of. You are assured that from these super-stations electricity is generated at a very low figure. Granted. Mr. Hatton, in his report, gives us some very useful figures with regard to coal consumption at various stations, varying from 5 lb. down to as low as 2 lb. per unit. The cost of generation from an engineering point of view, and from a technical point of view, is certainly all very well, but if you pile up your distribution and capital charges the advantage of the low cost of generation is lost, and care must be taken that the burden of capital and other charges does not outweigh the advantage of cheap generation. It seems to me that the great point that has to be watched is that, where stations are taken over and where schemes are brought forward, some guarantee shall be given that we are going to get a cheaper supply of electricity in place of the stations that are taken over. Mr. Hatton, in one paragraph, talks about a variable price. Now if we are to have a variable price, that is to say, if the price of supply to a small town is to be governed by the existing cost of generation, then why take over the small towns ? I take it that in any particular idea of lumping the supply the strong point is that we shall get a universal price, and if you are going to get cheap electricity it seems to me the only way to do it is to have a standard price. There are one or two other points in Mr. Hatton's paper which are of great interest. As to his remarks with reference to the spreading of manufactures over various districts, it seems to me there are other considerations in regard to the location of industries. For instance, in regard to the steel trade, we have Sheffield as a steel centre, because you have the necessary raw materials at hand ; Manchester as a cotton centre because the environment is suitable for cotton ; the Tyne for shipbuilding, because the environment is suitable for shipbuilding. I do not think the distribution of industries is a question of power supply altogether, and I do not think that we are going to do away with freight by distributing these centres flatly all over the country, as suggested by Mr. Hatton.

Mr. C. L. E. Stewart (borough electrical engineer and tramways general manager, Rawtenstall).—I should like to thank Mr. Hatton for his paper, and to express my appreciation of the report which he sent to his committee and of which he very kindly sent me a copy. I think the most remarkable thing in connection with any of the reports issued has been this. You read the Coal Conservation Report, and then read the Electric Power Supply Report, and note how they compare. To my mind they show in the time that elapsed that practically the bottom had been knocked out of the Coal Conservation Report. Their second report was watered down and was a much more carefully considered report altogether. Now, the first report really gave everybody to understand that we were going to get something for nothing, as Mr. Hatton says, but when one comes to look into the history of various stations, and follows them along for a number of years, what do we find ? Do we find the large stations generating all the cheap power ? No, we find certain stations of very moderate dimensions are beating them, and therefore up to the present the big station has not proved its case. Of course a very great deal depends on the particular local circumstances, and one must not pick out stations here and there and draw positive conclusions without knowing local circumstances. But when one finds that as a whole the big stations are beaten by quite moderate stations, it makes one rather think. Now I should like to mention a point where I think a lot of people get rather misled, and that is that all the reports have dealt with units *generated*. Now they have made quite a big show with units generated. I should just like to illustrate what this means by giving figures of my own station which supplies the tramways and also gives a general supply. If you want to put the Rawtenstall electricity undertaking on all fours with the figures given in the *Electrical Times* for tramways owning their own generating stations, remember first of all there is no management, no capital, no rates and taxes, and a lot of other items of expenditure included in those figures, and therefore the figure simply compares with works costs. Rawtenstall's total over-all cost, including capital charges and distribution losses, is ·9d. per unit sold. The works costs amount to ·4d. per unit generated, but we have to get ·9d. per unit to cover the capital charges, management and distribution losses, etc. In connection with these large supplies the distribution loss, I should say, would amount to 20 per cent., so that they have got to better the figures by 20 per cent. right off. Now going into the question of big areas of supply, I do not think anything could have been more striking than the remarks made by Mr. Fenton, of Sheffield, and borne out by Mr. Pearce, of Manchester, at the I.M.E.A. meeting this year in connection with large power supplies, and one must not get mixed up between the large power-stations and the large areas of supply. Mr. Fenton told how he had to go into the question of building a new station for giving very large power supplies, and drew up a report on putting down a station on an ideal site at varying distances from the centre of his load, and found that when everything was taken into account it paid best to put the station near the centre of load in spite of the handicap in the way of cooling towers, etc., rather than go a distance of 20 miles away. His remarks are well worth reading in the *Municipal Electrical Association's Journal*. They were very striking and exceedingly well thought out. His report to his committee was not got up for the occasion, but it was got out because they had the load to supply, and had to find the best means of supplying it. Mr. Murray asked some questions with regard to the Electric Power Supply Committee's Report, and I think I can answer some of them. There were several members of the committee who prepared the report present at the I.M.E.A. meeting. This is what I gathered—I may or may not be right—but I give you what I understand from the discussion. In the first place it was not intended to set to and scrap all existing stations ; it was not intended suddenly to go and build a lot of super-stations. The idea was to appoint a Control Board who would have a general scheme in mind in letting the smaller and less efficient stations drop out as circumstances permitted, and extending suitable economical stations in suitable areas. His next question was about the distribution loss. All I can say is that no figures, even in the first report of the Coal Conservation Committee, were given to show that it would pay an economical station to take a supply in bulk. When distributions and other charges are added, the cost to the consumer would be higher than at present, and the pounds of coal that super-stations would have to burn per unit delivered to the consumer would be higher, and after all that is the only thing that matters. It is no good merely generating cheaply if you are going to lose all the advantage so gained in delivering the power to the consumer. I think you will find distribution an exceedingly heavy item, not only in capital but also in loss of current. According to the report, private plants appear as though they would be allowed to remain, but it does not look fair that firms using the national asset, coal, should be allowed to go on burning coal as they like while certain other people are to be stopped. Then there is another point too which I think may turn out to be rather more serious than might appear at first sight, and that is that as soon as they decide that the various works are going to be taken over by the Government they are going to lose what I believe is a most valuable asset, which is the individual effort of each man to try and show up well with his friends in other towns. Take them over by the Government, and they become simply one tiny little wheel in the Government machine. There is another point which has been raised in the discussion in regard to the difficulty in standardisation. Clearly the Electric Supply Committee's Report only has one thing in mind, and that is generation and main distribution. What one wants to get clearly in mind is that there are only two things that matter, which to my mind must be standardised whatever purpose the current is going to be used for. One is that it has got to be a 3-phase alternating current, and in the second place a standard frequency. You can have what voltage you like, it only means putting in a transformer having an efficiency of about 99 per cent. You can alter any voltage for any special purpose. If you want direct current or anything different you only convert the little bit you want for that purpose. Have the main standard of one frequency, and that should be 3-phase, and then I think you have cleared the whole job, and that is I think all they mean in their standardisation.

Digitized by Google

Mr. C. Furness (borough electrical engineer and tramways general manager, Blackpool Corporation Tramways).—I was not going to enter into a discussion on the merits or demerits of this report on electric power generation, but I rather feel the discussion is degenerating and rather detracting from that report. As I hold very strong opinions from a national point of view that it is in the right direction, I feel that it is my duty to stand up and support it. I think there is a mistaken impression in regard to the intentions of the committee who drafted the report. There is no intention, in my opinion, to scrap plant that is efficient in order to generate cheap units. I think one has to look to the future developments in regard to the generation of electricity, and you can only do that by looking at your local circumstances and environment. I do not wish to follow the line which some other speakers have taken by referring to my own particular town and put that forward as an example and argument against centralisation. Let any one of us here take their own station, and we find we have been strictly marking time since August, 1914, in regard to capital expenditure. I know of a certain town with seven generating stations within a six mile radius, each of which is waiting to spend capital in the development of its own particular undertaking. Immediately Blackpool can get sanction we want to spend at least £100,000 in extensions on our own power-station. I know many other undertakings within a few miles radius which have a large prospective capital expenditure in view. We should reach altogether about some £300,000. Now the question very properly is—which is the best way of laying out this future capital expenditure? Shall each of these six or seven municipalities go their own way separately in buying generating plant, in putting up buildings which represent unremunerative capital? Shall we each go our respective way; or shall we have a joint board and find out the best means of spending that £300,000 in generating plant, when we could put down a unit five times as large as one individual station could require? (Applause.) That is the touchstone in this report which is before us this morning. I am very pleased to have heard the discussion, but I cannot congratulate the executive in suggesting to Mr. Hatton to write a paper on this matter. I am pleased Mr. Hatton has taken the burden upon his own shoulders. I do not think, with all due respect to the conference, we are in a position as tramway managers to seriously discuss it this morning. I think we have far more important matters in connection with tramway work than discussing this report. I feel that I would like to have heard a discussion on trailers, the Coal Controller's order regarding the 15 per cent. reduction, etc. The time will come when we shall have to exercise our minds on more practical matters than this report.

The President.—We have not time now to discuss trailers.

Mr. Furness.—I am only pointing out that there are practical matters of very serious and immediate concern for this conference, more pertinent than the paper we have had this morning. I do not altogether agree with Mr. McElroy's figures. I think he takes rather an inflated view of the importance of traction supply in the generation of electricity. Manchester takes only 15 per cent. of the city's electricity output for traction purposes. The cost is not altogether of such serious moment. I do not believe in the fetish of low cost which is overshadowing other important considerations governing electricity generation and distribution. Any sound commercial undertaking can afford to pay a reasonable price for electricity, and should not be in a position to object, and supply authorities ought to have a reasonable margin of profit. I do not believe there is any need for such great importance to be attached to tramway supply in connection with this report; 25 per cent., as Mr. McElroy said, is over the mark. But I will not labour the point, and will only mention that at Manchester the power cost is only 13 per cent. of the revenue obtained, and at Newcastle only 7 per cent. of the undertaking's revenue. In Blackpool it is 12½ per cent., and we are generally charged with having a high price for our traction supply. Cardiff holds the record with 5 per cent. of traction charges to their revenue. In Birmingham it is 20 per cent. Really the cost of traction current is not a dominating one; capital charges and the cost of wages, maintenance, and other things are far more important than the cost of power.

Mr. E. Hatton, replying to the discussion, said:—I was led to believe this morning from Mr. McElroy that we were to have a gas attack. (Mr. McElroy.—You've had it.) Instead of that he has written another paper. With reference to the remarks of Mr. Webber, of Keighley, he, of course, is very well placed as he stated, and more closely represents a huge works. It may be that the extent of his area does not exceed that of Armstrong, Whitworth's works at Newcastle-on-Tyne, and of course his outlay on cables, etc., may be very small compared with his load. With reference to the question of breakdowns in big stations being proportionately worse than in smaller stations, I do not think that is borne out by the experience of the big power companies. Mr. Stokes, of Bexley, spoke on the use of coal for other purposes before generating power. I think that matter is being investigated by a Committee of the Government. Certainly on the north-east coast of England, as to heat from the consumption of coal used for other purposes, it is very largely used as a by-product in the generating of electric power. Mr. Wilkinson, of Huddersfield, spoke of the value of a tramway authority having its own power-station, and he is quite right in what he said. His remarks also very closely apply to my own case. With regard to Mr. Rayner, he speaks of my having changed my mind. The first report I made was on the Coal Conservation Committee's Report; the other report had not appeared on that date, and I could therefore only speak of what was then before me. Many of us would like to remain as we are, but if the Government of the country decide that in the national interest we must all come together, why then we must all come together. But in that case we must have public control, not company control. (Hear, hear.) I do not know that I have very much to say on the remarks of Mr. Stewart, of Rawtenstall. Of course the question is simply as to the best way of generating and distributing electricity cheaply. We know of small stations that do so, but his position will be very seriously affected if electric traction on railways comes about. There is no doubt that it will have a tremendous bearing on the country, and why Mr. Furness, of Blackpool, should take exception to a meeting of the Municipal Tramways Association, whose undertakings are large consumers of electric power, discussing this matter I cannot understand, because if the electrification of the railways comes about it will have an important and vital effect on tramways, not to their detriment, but possibly to their enormous expansion. He further thought that it would have been better to discuss trailers and matters of that sort. Well, he is entitled to his opinion, but you will ultimately have a national supply set up, and we in Newcastle and the authorities on the north-east coast, with certain exceptions, are preparing a scheme whereby large consumers also will be on the Board, and therefore I took it you would feel an interest in such matters. It may not be in Mr. Furness' interests to have such a Board, but that is a matter for himself. (Hear, hear.)

The President said:—We are indebted for this very interesting discussion to Mr. Hatton for his paper, and also to Mr. McElroy for leading off. I want to move that the thanks of the conference be given to those two gentlemen for the way they have introduced the subject.

This was agreed to with acclamation, and the morning's session was then concluded.

AFTERNOON SESSION—THURSDAY.

The President again presided at the afternoon session.

TELEGRAM FROM THE PRESIDENT OF THE BOARD OF TRADE.

The following telegram to the President from Sir Albert Stanley, M.P., President of the Board of Trade, was read:—

"I extremely regret, owing to the railway situation, that it is impossible for me to be away from the Board of Trade to-day. Greatly disappointed from fulfilling engagement to lunch with Association, as I had looked forward with great pleasure to meeting and addressing your members. One matter to which I had intended to refer in my address is the coal situation. The necessity for coal economy is at present one of the most vital considerations, and I am sure I can rely upon your members realising this, and making every effort to economise. While it is true that tramway undertakings are being asked to make every possible reduction in their coal consumption, they are most certainly not being singled out for special treatment in this respect. The coal position at the present time is that even certain munition works are short. The domestic supply is extremely short, and for several months past it has not been possible to ship to our Allies or to the neutral countries the amount of coal which the Government is under obligation to despatch. If and when the rationing of coal for industrial purposes is put into force there will be many industries which will be compelled to make a much greater reduction than 15 per cent. With regard to those undertakings who really do make the reduction which has been asked for, it will be an especial obligation of the Board of Trade and the Coal Mines Department to see that they obtain the amount of coal necessary to run the reduced services, and no effort will be spared to secure this. Please accept and convey to your colleagues my sincere regrets at unavoidable absence, and best wishes for the success of your meeting.

ALBERT STANLEY."

The President then announced that the meeting of the Conference Executive might have to be held after the meeting that afternoon instead of the following morning, as some of the members were unable to wait till then. He also drew the attention of the Press to the fact that the important subject for discussion, viz., A National Joint Council for the Tramway Industry, would be considered in committee, and that the discussion was not to be reported except by the official shorthand writer.

The conference then resolved itself into committee and discussed at length the draft constitution of the National Joint Council.

Digitized by Google

FRIDAY MORNING SESSION.

MEETING OF THE MANAGERS' SECTION.

Mr. J. B. Hamilton presided over a formal meeting of the Managers' Section on Friday morning, held at the Town Hall.

The Acting Secretary (Mr. W. Clough) reported that the spring meeting of the Section, arranged to be held at Birmingham, had been abandoned in consequence of the difficulties of travel and the pressure of other meetings connected with tramway industrial affairs.

Mr. A. L. C. Fell suggested that at the next annual conference, in view of the volume and nature of the business, the meeting of the Managers' Section should be called the day before the conference, so that there would be ample time to discuss any matters requiring attention. It would be a pity if the Managers' Conference ceased to exist.

Mr. J. M. McElroy pointed out this necessarily enlarged the time occupied by the conference, and managers might be in a difficulty. He moved that a meeting of the section be held in the coming spring, and this was agreed to.

Mr. A. Baker said he was extremely sorry the meeting fixed for Birmingham had to be abandoned, but he knew that at the time owing to prevailing circumstances it was the right thing to do, especially as many meetings of the Executive Council were taking place about that time. He took the opportunity of again extending a cordial invitation to the managers to meet at Birmingham next spring. This invitation was accepted with thanks by the chairman, and the proceedings terminated.

THE ANNUAL GENERAL MEETING.

The annual general meeting of the members of the Municipal Tramways Association, Incorporated, was held in the Council Chamber at the Town Hall, Leicester, on Friday, September 27, the President (Alderman S. Flint, J.P.) in the chair. There was a large attendance.

The minutes of the preceding annual general meeting were taken as read and confirmed as printed and circulated.

REPORT OF THE EXECUTIVE COUNCIL.*

The annual report of the Executive Council was submitted.

Mr. J. B. Hamilton (chairman of the Council), in moving the adoption of the report, said the Council had had a very busy session, with many meetings, and the amount of work which had been got through was only partly represented even in the long report before them. This, perhaps, was due to the endeavour to keep it within limits, but even so it was longer than they would have liked it to be. They had scarcely done justice to one committee, which was dealing with the question of the standardisation of overhead line material. That sub-committee had been working most assiduously during the year, and whilst the only decision come to was the one recorded in the report, viz., on the question of overhead gear, he knew that at the present moment they had in hand a great deal of work which would bear good fruit in the immediate future. He thought it was only right to mention that, because he knew the work the committee had done, and it was exceedingly valuable. Then he was also reminded that in the paragraph dealing with the Board of Trade Tramways Committee they ought to have included a fact known to most members, i.e., that Mr. Fell (London County Council) and Mr. Dalrymple (Glasgow), in addition to three other gentlemen, had been appointed on that committee. It was unnecessary to say anything further; the year's work had been fairly recorded, and he hoped the members would accept the report.

The motion having been formally seconded,

Alderman Fletcher (chairman, Wigan Corporation Tramways Committee) suggested it would be advantageous if in future the annual report of the Executive Council were circulated before the meeting, in order to give members an opportunity to appreciate its contents.

The President intimated that the suggestion would be adopted.

Mr. A. R. Fearnley (general manager, Sheffield Corporation Tramways) endorsed the remarks of the chairman of the Council in regard to the work of the standardisation sub-committee. He agreed that the report hardly did justice to that work. It would be within the knowledge of the professional members of the Association at any rate that the work of this committee was likely to be very valuable to all tramway undertakings in the country. He was glad to see that the Tramways and Light Railways Association was collaborating with them. The committee had held numerous meetings, had visited a large number of tramway undertakings throughout the country, and were going very thoroughly into this question of standardisation. It might be of interest to some members of the Association to know the opinion of manufacturers on this question. As a result of communications with them, a variety of opinions had been expressed, generally to the effect that it was more than time that something of the sort was taken in hand. One large firm wrote that their manufacture of tramway material was so extensive, and covered such a multiplicity of design, that it would not be practicable to submit drawings. Another firm, pioneers in the tramway industry, stated that there were so many different types, involving a variety of patterns, that they discontinued the manufacture of them some three years ago. They had drawings of the various material they supplied, but as these were practically obsolete, they did not think it would serve any useful purpose to send them on. They fully agreed with the committee as to the desirability of standardisation. He thought they ought to, and he was sure the members would, give Mr. Harvey, of Ilford, the chairman of the sub-committee, all possible support in the efforts he was making along with other members, Mr. Wilkinson, of Huddersfield, and over-line superintendents in various parts of the country, to carry out this important work.

Mr. Furness referred to the meetings of the Executive Council, and suggested that it was desirable that the report should contain information as to the attendances of the members.

The Acting Hon. Secretary accepted the suggestion.

The motion to adopt the report of the Executive Council was then agreed to *nem. con.*

FINANCIAL STATEMENT.

Mr. Fearnley (hon. treasurer) submitted the statement of accounts and balance sheet, and said if there were any questions in regard thereto he would be pleased to answer them. The expenditure showed an excess of £56 17s. 3d. over income. In view of the difficulties of the times there was nothing remarkable in that. The excess was due to the increased cost of printing, typing, stationery, etc.

On the formal motion of **Alderman Fletcher**, the statement of accounts and balance sheet were received and adopted.

Vide pages 242-244.

ELECTION OF PRESIDENT.

The President.—Gentlemen, the next motion I have to submit to you is really a matter of form. Mr. Goodyer has been our vice-president for the past year, and has been the supporter of the committee generally. I have now great pleasure in proposing that he be asked to fill the presidential chair for the coming year. I need not say anything to extol his virtues to a gathering of tramway administrators. He is a man of considerable experience in tramway work, and a very genial man withal, capable of putting forth a lot of effort. He has devoted a good deal of time to the Executive Council, and has been a very earnest attendant at its meetings. I am quite sure that he will make a very good president for next year. He has had a good deal of practice during the last few months, as the chairman of the Executive has already told you, for the work of the Executive has been considerable, and there will be plenty for the president of this Association to do in the near future as well as for the chairman of the Executive.

Mr. W. J. Squires, J.P. (member of the London County Council).—I rise with very great pleasure indeed to second the nomination of Mr. Goodyer as president for the coming year. I have known him now for many years, perhaps because he is closer to us in the London County Council than any other tramways undertaking in the London district. I venture to say this, gentlemen, that our friend, Mr. Goodyer, has to prepare himself for an arduous year's work, and I think he must bear one fact in mind, that he is following the very many excellent presidents which it has been the happiness of this Association to possess. Therefore to inspire and encourage him, I hope that we shall be unanimous in electing Mr. Goodyer, and on behalf of the London County Council, which is in close contact with Croydon and the surrounding districts, I venture to express the hope that he will be acceptable to the whole conference.

The motion was then put and carried with acclamation.

Councillor A. A. Thomson (chairman of the Croydon Corporation Tramways Committee).—May I be allowed, as chairman of the Croydon Corporation Tramways, to heartily congratulate our tramways manager on the signal honour which you have just conferred upon him. I most heartily endorse the remarks which you, sir, have made, and I am very glad indeed to think that Mr. Goodyer's ripe experience and abilities, of which you are cognisant as I am, have been recognised in this way. I think it is a fitting acknowledgment of his many years meritorious service in the tramway world, and I have no doubt that his sound judgment and advice will be an immense advantage to the Association in its anxious deliberations in the future. His election, I feel, is not alone honouring Mr. Goodyer, but that you are also honouring Croydon. I very much appreciate this, and I wish him a very happy year of office, and predict for him a very pleasant time, because he possesses your confidence and esteem. (Applause.)

Mr. T. B. Goodyer—Mr. President, Mr. Squires, and gentlemen, I thank you exceedingly for the high honour you have so generously and unanimously conferred on me to-day in electing me as president of this important Association for the ensuing year. I recognise very fully that I am following a number of distinguished tramway managers, who have set before us very high ideals indeed as they have passed through their years of office. But with your

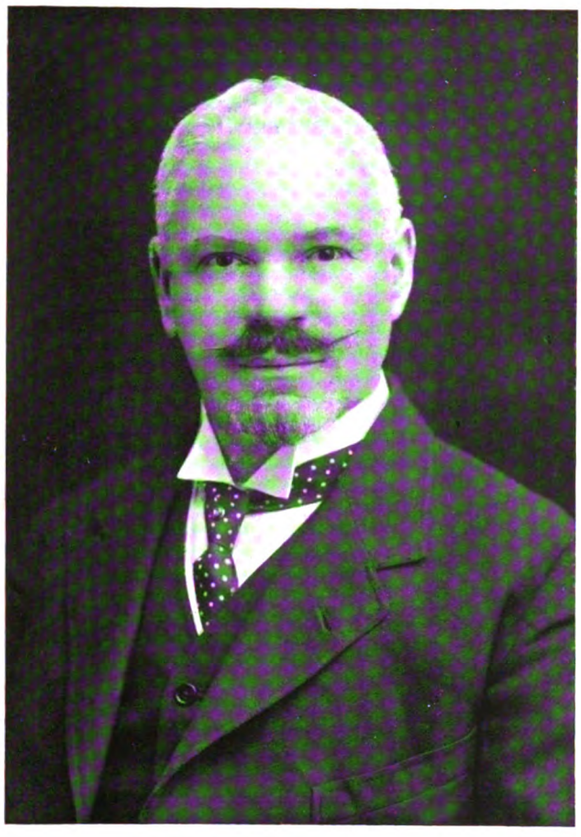
Digitized by Google

kind support, and with your co-operation, I sincerely trust I shall not be found at the end of my term to have been unsuccessful. I thank you very much.

ELECTION OF VICE-PRESIDENT.

Mr. T. B. Goodyer, taking advantage of the privilege of the incoming president, submitted the name of Alderman Sir John Courtis, Deputy Lord Mayor of Cardiff and chairman of the Cardiff Corporation Tramways Committee, as vice-president for the ensuing year. As they were all aware, Sir John had attended the meetings of the Association for many years, and had taken a considerable part in their discussions and in the business of the Association. He was a member of the Executive Council, on which he had already done very excellent work. He submitted his name with confidence, and trusted that his election would be unanimous.

Mr. G. A. Johnston (chairman, Dundee Corporation Tramways Committee) seconded the motion with a great deal of pleasure, and said those members who had attended the meetings of the Association during the past few years could appreciate the ability Sir John Courtis had displayed in the discharge of his duties as a member of the Association. They felt honoured that Sir John had consented to fill the office.



Mr. T. B. Goodyer,
President of the Municipal Tramways Association for 1918-19.

The President said they could not find anyone more suitable to fill the office. Sir John Courtis was a man of wide experience, and had energetically devoted zeal and interest to the work of the Association in many ways. He was quite certain he would reflect credit on the office and give satisfaction in every way.

The motion was carried with acclamation.

Sir John Courtis, in acknowledgment of the honour done him, thanked the mover, seconder, and president for the kind remarks they had made upon his nomination. He had been a member of the Association for quite a number of years—he was almost afraid to think how long, for it might make him seem an old man—but he had taken an interest in it for some eighteen years. He had only recently been elected a member of the Executive Council, so he had not much of a record to show. He did not know whether it was because of his appointment or not, but since he had been a member of the Council the meetings seemed to be very much more frequent than they were before. He had attended the meetings very largely as a listener, as his colleagues would bear out, but it seemed to him that the Executive had very arduous duties in front of them, and a very busy year in prospect. He could only say that it would be his endeavour in his new position to do everything he could to benefit the Association, and especially in support of the president, for whom he had the very greatest respect. He knew his father in Cardiff for a number of years, and had also known Mr. Goodyer himself for a long time. He felt the Association was fortunate in having such a man to step into the presidency, and he prophesied the Association would have a good year.

On the motion of **Mr. Fearnley**, seconded by **Alderman Linsley** (chairman of the Salford Corporation Tramways Committee), Sir E. R. Pickmere, M.A., town clerk of Liverpool, and Mr. S. F. James, town clerk of Ilkeston, were re-elected hon. solicitors.

ELECTION OF HONORARY SECRETARY.

The President said it now became necessary to fill the office of hon. secretary. It was with very great regret that he had to announce that Mr. C. J. Spencer had been compelled to resign the office. Personally he was very sorry, and he had no doubt that that feeling was shared by every member of the Association who realised not only the importance of the secretarial work, but also its heaviness. They all knew the sterling way in which Mr. Spencer had discharged the duties of his office. He had always found that Mr. Spencer laid himself out as far as he could in whatever position he held and threw his whole heart into the work. Sometimes he wondered how Mr. Spencer got through his personal work as well, but they were most grateful for the way in which he had devoted his energies and abilities to the work of the Association. It was a very pleasant thing, and one could not speak too highly of the way in which Mr. Spencer had looked after the interests of the tramway industry. They did not like to hold men back when openings occurred which might properly be regarded as promotions; it was their duty to see that no obstacles were put in the way. In parting with Mr. Spencer under these circumstances, they felt they were getting a friend in another sphere, and no doubt his interest in tramway administration and the tramway organisation would continue in the years to come. He did not think it would be possible, even if he wanted to, for Mr. Spencer to be otherwise than interested in tramways. They would have an opportunity later on of showing their appreciation of what Mr. Spencer had done for them, and now it was for the Association to appoint someone to the office.

Mr. J. M. McElroy, in moving that Mr. W. Clough, general manager of the Bury Corporation Tramways, the assistant hon. secretary, be appointed hon. secretary of the Association, said he felt this office was assuming a different character from what it had done in years gone by. The work of the Association, particularly within the last six months, had changed considerably, and the Executive Council had had in mind that at some future, possibly early, date they would have to appoint a permanent secretary with offices to carry on the work of the Association. Those members of the Executive who had seen the enormous work that had had to be done by the hon. secretaries, first by Mr. Fearnley, who had done such valuable work for many years, then by Mr. Spencer, and latterly by Mr. Clough, would not be surprised at the development. These conferences and meetings involved an immense amount of work, which largely had to be done out of office hours. This kind of thing could not continue for many years longer. At the present moment, seeing that the proposals in regard to the Whitley Council had not yet formed definite shape, the Executive were not in a position to submit a precise recommendation in regard to the matter, but they suggested asking Mr. Clough to become the hon. secretary for the time being, subject to the Council thinking over the steps they would take for carrying on the secretarial work in the time to come. He therefore had very great pleasure in proposing that Mr. Clough be appointed hon. secretary. That gentleman for some months had been doing the work, and labouring for late hours every night, and he thought they would be doing him an honour by appointing him that morning. He moved accordingly.

Mr. Spencer, in seconding the motion, said he had been glad to be associated with Mr. Clough during the last twelve months, and could entirely confirm what Mr. McElroy had said as to the tremendous amount of hard work that gentleman had recently put in on behalf of the Association. Previous to that Mr. Clough had put in some good work for his country at the Admiralty, where he was very closely associated with him. He had formed a very high opinion of Mr. Clough's ability and fitness to hold any post which he might be called upon to fill. The Association would be serving its own interests as well as honouring the assistant hon. secretary by making the appointment.

Councillor J. Timpson (Portsmouth) cordially supported the nomination. It had been his privilege recently to witness the way in which Mr. Clough had acted as assistant secretary to the Association, and he felt sure if he was elected that morning the Association would have no cause to regret the step.

The President said the choice was a very wise one.

The motion having been carried with acclamation,

Mr. Clough, in acknowledgment, said he fully recognised the honour which had been conferred upon him that morning, and in accepting the office he quite realised the able and excellent men whom he was following. All he could promise them was that he would aspire to do equally good work to that which had been done in the past. He would do all he possibly could to make the Association, so far as he was concerned, the success which it had undoubtedly been in the past. (Applause.)

Digitized by Google

PRESENTATION TO MR. C. J. SPENCER.

The President said that it was proposed to intervene in the course of business in order to show their esteem for Mr. Spencer, and express their appreciation for the work which he had done during the last seven years for the Association. He would ask Mr. Hamilton, the chairman of the Executive Council, to say a few words. (Applause.)

Mr. J. B. Hamilton said it was his most pleasing duty to have to draw the attention of the members for a few minutes to a very pleasant function, apart from their formal business. As they had already heard from the President, Mr. Spencer had been called to a higher sphere of public duty. His responsibilities would be greatly increased, and many of those who had been associated with him desired to express their appreciation of the services which he had so ungrudgingly rendered to them for the last seven years, during which he had held the office of secretary of that Association. They desired to show in some tangible form their respect for him, and admiration of the work which he had done, so that he could carry it with him in his new sphere as a simple reminder of the friends with whom he had been associated in past years. He need hardly say that this little movement, having been once initiated, was immediately and spontaneously carried out by all the members, the most gratifying response being given to the proposal. He took it that Mr. Spencer would regard the significance of the gift at its highest value. If one went back, as Sir John Courtis had done, for a number of years, one would understand why they felt in this way towards Mr. Spencer. It had been his own great pleasure to nominate Mr. Spencer for election as hon. secretary at their Glasgow meeting in 1911, and he then ventured to prophesy that in Mr. Spencer they would have a worthy successor to Mr. McElroy and Mr. Fearnley. He thought that his prophecy in that respect had been fully justified, and he could further testify to the sterling managerial work of his friend Mr. Spencer in the neighbouring undertaking. Beyond that it was a good many years since he had made Mr. Spencer's acquaintance ; indeed, he met him when he was a small boy, and had been astonished at the frank audacity of the youth who had talked to him. At that time he asked himself, " What is this chap going to come to ? " for he was laying down the law on the subject of brakes. They all realised that in Mr. Spencer they had a man with infinite capacity to administrate, and this had been a great source of satisfaction to the people of Bradford, who were very sorry to lose him ; but this would doubtless also be to the advantage of his colleagues and the tramway industry.

In his own capacity as chairman of the Executive Council, his relations with Mr. Spencer had been very close, especially at a time when the alteration of social and industrial conditions had culminated in work of a new character. The formation of Whitley Councils for dealing with municipal labour matters had been suddenly thrown upon them by the coalition of the various trade unions, and as a natural consequence the duties of the hon. secretary of that Association had tremendously increased. But he was glad and pleased to say that on every occasion Mr. Spencer had shown himself absolutely equal to the increased work and responsibility which had been thrown upon him. It was unnecessary to detain the members longer, because he felt that every one of them was absolutely with him in this tribute which he was endeavouring to pay to their old friend and also to Mrs. Spencer, whose share in the work ought not to be forgotten. In his new sphere Mr. Spencer would take with him the gratitude, the good will, and the warmest thanks of his friends in the tramway administration of this country ; and he believed they would not look in vain to Mr. Spencer's assistance and influence in the new sphere of public duty to which he had been so honourably and wisely promoted. (Loud applause.)

The President then asked Mr. Spencer to accept a gold watch with the inscription, " Presented to C. J. Spencer, Esq., of Bradford, by the members of the Municipal Tramways Association in recognition of the valuable services rendered by him as hon. secretary, 1911-1918, September 27, 1918." He also asked Mr. Spencer to accept on behalf of his wife a very handsome silver-fitted dressing-case. He explained that every officer and member associated themselves with this mark of their esteem, admiration, and respect—he might go further and say affection—(applause)—for their old friend Mr. Spencer. They hoped that he would receive the gift as an encouragement for the years that were to come and a proof that although they were parting with him they had lost nothing of their old feelings of regard for one with whom they had so long and successfully worked. They associated Mrs. Spencer with the gift because they knew that she too must not only have made sacrifices, but have inspired and encouraged her husband to do all that he had done in his great work on behalf of the Association for so many years. (Loud applause.)

Alderman Priestley (chairman, Bradford Corporation Tramways Committee) desired to express on behalf of the city of Bradford their sense of gratitude at the kind words of Mr. Hamilton and the President. Mr. Hamilton had described Mr. Spencer as an audacious lad, and as one who had been closely associated with Mr. Spencer for a number of years he felt that the description was not unjustified. It had been his privilege to work with Mr. Spencer in Bradford, and his experience led him to say that every tribute paid that day to their friend was absolutely justified. Everything that had been said was true in regard to his energy and the earnestness with which he had thrown himself into the work of administering an important system of tramways. He wanted to say that, although Mr. Spencer's services to the Association had meant some sacrifice on the part of the Bradford Corporation, they had received a great deal in return for those services in the shape of experience and administrative knowledge. They were sorry to lose Mr. Spencer. It would be a positive loss to Bradford ; they would like to have kept him, but they felt that while this was Bradford's loss it would be a gain to the great city of London. Mr. Spencer had given them high services, and he was eminently fitted to render great service in whatever sphere he entered. He had endeared himself not only to the citizens of Bradford but also to thousands of workers in the tramway industry ; indeed this was so to an extent not equalled in any other undertaking that he knew of in the kingdom. He left them with the best wishes of all the people of Bradford, and they sincerely hoped that he would be happy in his new sphere. All he (Alderman Priestley) could say was, as the village blacksmith said to his daughter when she left home on being married, " Well, lass, if he (the husband) doesn't do reight to thi, tha mun coom back whoam agean." He wanted to say that at any time Bradford would be only too glad to have Mr. Spencer come back again. (Loud applause.) He added that Lieut. Newman, a former deputy

Mr. C. J. Spencer,
Hon. Secretary, 1911-18.

chairman of the Bradford Tramways Committee, who was present, desired to be warmly associated with the sentiments he had expressed. (Hear, hear.)

Councillor J. F. Akeroyd (deputy chairman, Bradford Tramways Committee) said that although he had only been associated with Mr. Spencer for two or three years, it had been long enough to enable him to form a high opinion of that gentleman's ability. That day happened to be his own birthday, and he sincerely hoped that Mr. Spencer, whenever he looked at the watch, would remember him, for he could assure the meeting that he should always esteem him most highly.

Alderman A. Fawcett (vice-chairman, Halifax Corporation Tramways Committee) also testified to the satisfaction with which the people of Halifax regarded the honours which were being paid to Mr. Spencer, whom they had known from boyhood. They had watched his progressive career with undisguised pleasure.

The President then made the presentation amid applause.

Mr. C. J. Spencer, who was received with loud applause, said, Mr. President, Mr. Hamilton, Mr. Alderman Priestley, and gentlemen, I am sure you will quite understand that in the very special circumstances of this morning I can scarcely hope to compete with the eloquence already displayed in this room. I feel far more than I can express extreme gratitude and thankfulness for the very

Digitized by Google

kind and generous sentiments which have been uttered by the various speakers. Now, sir, this is not altogether a pleasurable occasion. I am parting with the Municipal Tramways Association. I had the honour to be at the first meeting at the inception of this Association at Manchester, where, in Mr. McElroy's office, with Mr. John Young, of Glasgow, in the chair, it was considered desirable that the managers of the various tramway undertakings in the country should form some kind of Association for the interchange of ideas. As you know, that Association has now grown into something very different. It was considered that to give this Association a proper status in the country membership should extend to others than managers, and Corporations themselves—through their chairmen and deputy chairmen of Tramways Committees—became members of the Association. My pride as your honorary secretary in the achievements of this body has been in the past, and is to-day, very great. I consider that I have had great privileges and a very great honour in being able to follow my predecessors in office, Mr. McElroy, the first honorary secretary, and then Mr. Fearnley, of Sheffield. The Association has steadily grown. I remember the words of my good friend Mr. Fearnley, who was then vacating the office, when I was first asked to take the position of secretary. He said, "Well, it means a lot of hard work, Spencer, but you will never regret it." Mr. Fearnley was absolutely right. The opportunities which come to the hon. secretary of this Association in the way of education in his own business are wonderful; and I know of nothing which has had more effect in widening my ideas and lifting the horizon of my view than the affairs of the Municipal Tramways Association. I just put this hint forward for the many members who are in this room who may at some time aspire to this or a similar office in the Association. It means hard work, and a good deal of hard work; but it is pleasant work and it is educative, and from the selfish point of view it is worth while. I have been associated as your hon. secretary with the Executive Committee for a good number of years. I have had the honour to be associated with a number of committees, but I have never yet met a more businesslike or a better body than the Executive Council of the Municipal Tramways Association. Their deliberations, as I am sure you will all agree, have always been of the very highest order, and such as will educate any man who has the privilege of sitting there and having something to do with the matters they are discussing.

Now, sir, I could not possibly have continued as your secretary, or even have acted in the first place, without the consent of my Corporation of Bradford. The Bradford Corporation very cheerfully gave consent when the matter was first mooted to them, and I do not think that it is always realised what a burden of work falls upon the tramways office of a Corporation whose official may be the secretary of this Association. I would like here and now gratefully to recognise the kind forbearance of my chairman and my committee at Bradford. The Corporation have undoubtedly done well, and are deserving of thanks from this Association for the part they have taken. (Hear, hear.) On the other hand, as my chairman, Mr. Alderman Priestley, properly recognised, undoubtedly some benefits have accrued to the Corporation. No time can possibly be wasted in educating their own officials, and in the widening of view and in the knowledge of the troubles of other people this has paid the Bradford Corporation to some extent for the sacrifices they have been making in other directions. In addition to the assistance of the Bradford Corporation, which I most gratefully recognise as far as I am personally concerned, I also recognise the assistance which I have received, first from Mr. Falkingham, my secretary at Bradford, and, later, from Mr. Wheatley. A great deal of the work has fallen on the shoulders of these assistants, and I beg gratefully to recognise the help that I have received. Now, sir, mention has been made of the future. I feel in accord with previous speakers that it is getting almost impossible to go on very much longer on a purely voluntary basis, and you will have to consider a very much bigger organisation.

Gentlemen, when I look at these very handsome presents, which are substantial tokens of what you have said, I scarcely know how to express myself. The watch is undoubtedly a good one. I have no doubt it will keep good time, and certainly after the speech of my deputy chairman I shall never look at the watch without thinking of him, and wishing him again and again many happy returns of his birthday. My wife, I am sure, were she here, would ask me to thank you very much indeed for the kind present you have seen fit to offer. As the president said, she is my better half, and when she hears of this she will be only too sorry she had no opportunity of expressing her thanks herself. There is little more that I can say except to again try and make you feel how much I regret this parting. I hope in the future I may have the opportunity of attending here, perhaps as a guest. I should not like to break off entirely my associations with all my friends in the tramway world, and in a sense I feel I am not leaving it altogether. Mr. President, Mr. Hamilton, and gentlemen, I again thank you for your great kindness to me. (Loud cheers.)

The President said that, interpreting the feelings of the meeting, it would not be agreeable that Mr. Spencer should cease to have any connection with the Association. It was fortunate there was a way out of the difficulty, and he therefore had very great pleasure in proposing that Mr. Spencer be elected an hon. member of the Association.

Mr. Hamilton formally seconded, and the motion was agreed to with acclamation.

Mr. Spencer returned his thanks for what he considered was the greatest honour of all. He had scarcely thought that such a thing could happen. It was an honour which he would highly prize in company with the only other gentleman, as far as he knew, who occupied the same position, Mr. John Young, the founder of the Association. (Applause.)

Election of Other Officers.

Mr. A. R. Fearnley was unanimously re-elected hon. treasurer, and Mr. Blakeborough, of Sheffield, hon. auditor.

The meeting then proceeded to elect members of the Council, the retiring members being Sir John Courtis, Messrs. Linsley, Fell, Hamilton, Holford, and Clough.

The attendance of the members of the Council having been read out, the following nominations were received for the five vacancies:—Messrs. Timpson, Horsfield, Fell, Hamilton, Holford, Slattery, Barnard, and Wylie.

On a ballot the following gentlemen were declared elected:—Messrs. Timpson, Fell, Hamilton, Holford, and Horsfield.

Mr. William Clough,
Hon. Secretary of the Municipal Tramways Association.

A resolution of sympathy with Mr. Robson, the general manager of the Southampton Corporation Tramways, expressing the earnest hope for his speedy restoration to health, was unanimously agreed to.

Councillor Raine (vice-chairman, Hull Corporation Tramways Committee) proposed a hearty vote of thanks to the members of the Executive Committee, and this was seconded and cordially agreed to.

Some discussion ensued upon the question of reconstituting the Council of the Association and an alteration of the Articles of the Association, but a motion to refer the matter to the Council was lost.

On the motion of **Alderman Fenton** (vice-chairman, Sheffield Corporation Tramways Committee), seconded by **Councillor Timpson** a hearty vote of thanks was accorded to Alderman Flint for his presidential services during the year and this was duly acknowledged.

On the motion of **Alderman Bowes,** a cordial vote of thanks was passed to the Corporation of Leicester and the chairman and members of the Leicester Tramways Committee, and Mr. Lucas, the general manager, for the arrangements made for the conference.

The President briefly acknowledged the compliment.

Councillor Raine moved that the question of an appointment of a permanent secretary and future office arrangements be referred to the Executive Council.

Digitized by Google

Mr. J. B. Hamilton, as chairman of the Council, accepted the resolution, and explained that the matter had been under consideration for some time, and, as already explained, the Council were only waiting a suitable opportunity to take a step forward. They hoped shortly to be in a position to make an announcement on the subject.

The proceedings then concluded.

ANNUAL REPORT OF THE EXECUTIVE COUNCIL.

The Executive Council submitted the following report on the work of the past year :—

Annual Conference.

Due to the continuance of the European War the Executive Council decided that instead of holding the usual annual conference, business meetings should be held at Leicester, extending over two days, the first day to be occupied by the reading and discussion of papers, and the second day by the annual general meeting of the Association.

New Members and Resignations.

The following have joined the Association during the year :—
West Hartlepool Corporation.
R. Oswald Baldwin, general manager, Corporation Tramways, Exeter.

There has been one resignation during the year, viz., Liverpool Corporation.

Membership.

Number of local authorities owning and working tramways in Great Britain	97
Number of local authorities that are members of the association or represented by officials	84
Number of members joined during the year	2
Number of members resigned during the year	1
Total number of members—Local authorities	75
Managers and assistants ...	110

Subscriptions of Members on Active Service.

The Executive Council decided that where it has been the practice of an individual member to pay his own subscription and he is on active service, such member shall continue in membership without payment until such time as he may return to civil life.

Chairman of Executive Council.

Mr. J. B. Hamilton (Leeds) was appointed chairman of the Executive Council in accordance with the amended form of Articles of Association, and has occupied the chair at the meetings of the Executive Council during the past year.

Honorary Secretaryship.

Mr. A. R. Fearnley, who has acted as hon. secretary *pro tem.*, after having held the position for a period of 14 months, found that it would be necessary to relinquish the office in consequence of his duties in connection with the Tramways (Board of Trade) Committee.

Mr. C. J. Spencer, who was about to conclude his temporary appointment with the Admiralty, was requested by the Executive Council and kindly consented again to take up the position as hon. secretary for the remainder of the Association year, and relinquished the office of hon. treasurer for this purpose.

Honorary Treasurership.

Mr. Fearnley, on handing over the duties of hon. secretary, was unanimously appointed hon. treasurer of the Association.

Appointment of Assistant Honorary Secretary.

In consequence of the increased work of the hon. secretary, the Executive Council, at their meeting on July 31, appointed Mr. W. Clough, general manager, Corporation tramways, Bury, to the position of assistant hon. secretary of the association.

Alteration to Articles of Association.

At an extraordinary general meeting of the Association, held on August 31, 1917, alterations to the Articles of Association in regard to chairman of meetings were approved. These were confirmed by an extraordinary general meeting held September 21, 1917.

Meetings of the Executive Council.

Since the last annual meeting, 13 meetings of the Executive Council have been held—11 in London, 1 in Manchester, and 1 in Birmingham. A number of committees and sub-committees have also been appointed to deal with specific matters, and these have reported periodically to the Executive Council.

Decimal Coinage.

The Decimal Coinage Association proposed to introduce a Bill in Parliament for the purpose of establishing a decimal system of coinage in this country and requested this Association to support the measure. A committee was formed to investigate and report. Subsequently the Executive Council decided to support the proposals. A resolution to that effect was forwarded to the Board of Trade and other authorities. The Bill as introduced failed to pass the second reading, it being considered the time was inopportune for any change in the coinage of the realm. A Royal Commission has now been appointed to "consider and report whether it is advisable to make any changes in the denominations of the currency and money account of the United Kingdom with a view to placing them on a decimal basis, and whether, if any alteration of the present system is recommended, it is desirable to adopt, with or without modification, the proposals embodied in the Bill recently introduced in the House of Lords by Lord Southwark, or some other scheme, and in the latter alternative to make specific recommendations for consideration by Parliament."

(National) Trade Advisory Committee (Disabled Sailors and Soldiers).

(Electricity, Power, Light, etc.)

A Trade Advisory Committee has been set up by the Ministry of Labour in conjunction with the Ministry of Pensions to advise those two departments as to the conditions under which the training of disabled men in this industry can best be given and the most suitable methods of obtaining convenient centres for it, and generally to secure uniformity in the training of disabled men. The Committee consists of an equal number of representatives nominated by associations of employers and of workpeople.

As representing the employers, Mr. Alfred Baker, the general manager of the Birmingham Corporation Tramways, was nominated by the Executive Council to serve on the Committee. This Committee has met at frequent intervals during the year, and has prepared schemes for presentation to the above-mentioned Government departments providing for the training of disabled soldiers and sailors in the minor operations of the industry as well as in the skilled trades.

The schemes cover the period of training in works and in technical schools, wages, maintenance allowance, etc.

The labours of the Committee are not yet concluded, but it is anticipated that much benefit will accrue to disabled sailors and soldiers as a result of their efforts.

Standardisation of Overhead Line Material.

The Executive Council invited the Tramways and Light Railways Association to appoint representatives to sit on the committee formed to consider the advisability of standardising overhead line material, and four representatives were duly appointed.

This joint committee has held meetings periodically throughout the year, and has confined its attention chiefly to the consideration of trolley wire.

Electric Vehicle Committee.

Mr. A. R. Fearnley, of Sheffield, was reappointed the representative of the Association on this committee.

Rule of the Footpath.

This question was the subject of discussion during the last annual meeting, when it was decided to communicate with the Home Office in order to ascertain if it were possible for the present practice of pedestrians keeping to the right of the footpath to be altered to "keep to the left," so that when proceeding along the pavement pedestrians would be always facing the traffic on the carriage-way, and many accidents would thereby be prevented.

The Home Office in their reply stated that they had no authority to make a regulation for the purpose of altering the existing custom, and that any change in this direction would probably involve legislation, which was not practicable at the present time. Having regard to the reply of the Home Office the Executive Council decided that, for the present, no further action could be taken in the matter.

Increase of Statutory Fares and Charges.

The following communication was received from the Secretary of the Board of Trade (Railway Department) :—

Copy.

"Board of Trade (Railway Dept.),
7, Whitehall Gardens, London, S.W.1,
February 21, 1918.

Sir,—With reference to the letter from this Department of March 5 last, with regard to the possibility of increasing the existing statutory maximum fares on tramways, I am directed by the Board of Trade to state, for the information of the Municipal Tramways Association, that the Tramways and Light Railways Association have now suggested that the existing maximum charges applicable to tramway undertakings should be increased by 50 per cent.

The Board would be glad to be informed of any views which your Association may hold in the matter, and to be furnished with facts and figures proving the necessity of any action which the Association may desire to recommend.

I am, Sir,
Your obedient servant,
(Sgd.) Ernest J. Moggridge.

The Hon. Secretary,
Municipal Tramways Association,
Division Street, Sheffield."

After consideration of the above, the Executive Council passed the following resolution :—

"That the Board of Trade should be invested with powers to increase the maximum statutory tolls, charges and rates in such cases where the necessity is proved to exist."

The President of the Board of Trade (The Rt. Hon. Sir A. H. Stanley, P.C., M.P.) received a small deputation on this question, and figures concerning various undertakings were placed before him showing the necessity of immediate action being taken as regards the revision of fares. He expressed himself satisfied that a case had been made for a temporary revision of statutory rates and charges, and suggested that the best course to adopt was the formation of a Select Committee of the House of Commons to take evidence

Digitized by Google

and report. Following this interview a Select Committee of the House was appointed, and the hon. secretary (Mr. C. J. Spencer) was requested by the Executive Council to give evidence before such Committee on behalf of the Association. The hon. secretary was also requested to give evidence on behalf of the Association of Municipal Corporations. The hearing took place on Wednesday, May 8, and the Select Committee presented their report on Wednesday, June 5, 1918. This report was circulated amongst the members and has also appeared in the technical press.

As a result of these investigations a Bill entitled "Statutory Undertakings (Temporary Increase of Charges) Bill," which gives power to increase fares for the continuance of the present war, and for a period of two years thereafter, has passed through both Houses and has received the Royal assent.

Tramways (Board of Trade) Committee.

The following communication was received from the Board of Trade (Railway Department), regarding the appointment of a Committee to assist tramway undertakings in the difficulties experienced as to the shortage of labour, material, etc.

Copy.

"Board of Trade (Railway Dept.),
7, Whitehall Gardens, London, S.W.1,
November 10. 1917.

Dear Sir,—I am directed by the Board of Trade to state for the information of your Association that the President of the Board of Trade has decided in view of the serious difficulties under which tramways are at present labouring, to set up an expert committee to consider the needs in respect of materials and labour of tramways essential to the prosecution of the war, and to take such steps as may be necessary to supply such needs even at some temporary sacrifice on the part of the less essential undertakings.

The president is confident that he can rely on the assistance of your Association in this important matter, and he would be glad if the Municipal Tramways Association would be good enough to nominate at the earliest possible moment three representatives to serve on the committee.

I am to add that it is proposed that Mr. James Devonshire should be chairman of the Committee.

I am, Sir,
Your obedient servant,
(Signed) Ernest J. Moggridge.

The Hon. Secretary,
Municipal Tramways Association,
Division Street, Sheffield."

The Executive Council at a meeting held on Wednesday, November 14, 1917, nominated Mr. A. R. Fearnley, Mr. J. B. Hamilton and Mr. J. M. McElroy for appointment as the representatives of the Association on the proposed Committee.

Mr. A. L. C. Fell, of the London County Council Tramways, and Mr. J. Dalrymple, of the Glasgow Corporation Tramways, are also members of the Committee.

The terms of reference of this Committee are as follows :—

> "To be a Committee to consider the needs in respect of rolling stock, materials and plant of tramways and light railways which are essential to the prosecution of the war, and, subject to the approval of the Board of Trade, to take such steps as may be necessary or desirable to supply these needs by means of transferring rolling stock, materials or plant from less essential tramways or light railways, or otherwise, as may be practicable. Representatives of the Board of Trade and the Ministry of Munitions will attend the meetings of the Committee in an advisory capacity when necessary."

An explanatory memorandum issued by the Board of Trade further defines the duties of the Committee in the following terms :—

(1) To take steps to provide, where necessary, for the loan or transfer of rolling stock, materials or plant from one undertaking to another.
(2) To determine the relative priority of the demands of various tramway and light railway undertakings for necessary materials and supplies, and to make the necessary arrangements in the matter.
(3) To deal with questions of new or increased services and the maintenance of existing services, and, if considered necessary, to make recommendations for the closing of the traffic of any undertaking, either wholly or in part.
(4) To consider the question of the construction of new lines, or the existing lines, and to make recommendations as to the supply of the necessary materials, plant, etc., therefor.
(5) To value the materials and plant which may be released by the reduction of services, or the closing of any existing lines, and to advise as to the amount of compensation payable in respect thereof, and the loss involved in revenue, if any.
(6) To consider such applications for the revision of existing statutory tolls and charges on tramways and light railways as may be referred to them by the Board of Trade, and to make recommendations as to the action to be taken.

Board of Trade Transport Board.

The attention of the Executive Council having been drawn to the fact that the Board of Trade had appointed a Road Transport Board, it was decided to request the Board of Trade to receive a deputation with the object of the Association being represented thereon. The President of the Board of Trade in his reply pointed out that there was no necessity at the present time for such a deputation, as the activities of the Road Transport Board would be confined to goods-carrying vehicles and would not affect tramway interests.

Military Service (Withdrawal of Exemptions) Order (No. 2), 1918.

Under this Order, as from June 22, 1918, certificates of exemption from military service were withdrawn respecting the following :—

Tramways (excluding Electrical Generating Stations).

	Grade.	Category.	Born in or after
(*a*) Traffic Inspector, Chief Storekeeper and Parcel Superintendent ...	1	A	1880
(*b*) Driver	1	A	1883
(*c*) All other classes of workmen ...	1	A	1875

With regard to the occupations coming under the heading of "Maintenance Staff," Code No. X004 of the schedule, representations were made to the Ministry of National Service as to their inapplicability to the tramway industry. A list of occupations comprised in the term "Maintenance Staff," approved by the the Ministry of National Service, was subsequently circulated amongst the members.

Board of Trade Committee on Electric Power Supply.

As intimated in the last annual report, negotiations were proceeding between the Board of Trade and the Association with the object of local authorities being given increased representation on this Committee, and the name of Mr. J. Dalrymple, of Glasgow, was suggested as the representative of the Association. The President of the Board of Trade in his reply pointed out that the Committee, as at present constituted, in his opinion was sufficiently representative of the general interests of the electric power supply industry, and that it was not desirable to increase the number of members.

The report of the Board of Trade Committee has now been published and contains proposals with regard to electric power supply which are of the greatest importance to tramway authorities. The Executive Council has appointed a committee to consider the effect which the adoption of these proposals would have on municipal tramways. On receiving the report of this committee, the Executive Council decided that it is desirable the Association should act in concert with the Association of Municipal Corporations and the Incorporated Municipal Electrical Associations and should urge upon them the necessity for immediate joint consideration of the matter.

Joint Industrial Council for the Tramway Industry.

The Executive Council has during the year taken active steps in the direction of the establishment of a joint industrial council for the tramway industry on the lines of the Whitley Report.

A committee consisting of the following members of the Executive Council was appointed to deal with this matter, viz. :—

Mr. A. Baker.	Mr. T. B. Goodyer.
Mr. W. Clough.	Mr. J. B. Hamilton.
Sir J. W. Courtis.	Mr. W. J. McCombe.
Mr. A. R. Fearnley.	Mr. J. M. McElroy.
Mr. A. L. C. Fell.	Mr. H. Mozley.
Alderman S. Flint, J.P.	Mr. C. J. Spencer (hon. secretary).

The committee held a number of meetings and subsequently attended joint conferences with representatives of the Tramways and Light Railways Association and of the National Transport Workers' Federation, at which a representative of the Ministry of Labour was present.

After general discussion of the subject at the joint conferences, a small sub-committee was appointed to draft a scheme for the consideration of the constituent associations. The members of the drafting sub-committee were :—

Mr. J. M. McElroy, Municipal Tramways Association.
Mr. C. J. Spencer, ,, ,,
Mr. R. J. Howley, Tramways and Light Railways Association.
Mr. R. Williams, National Transport Workers' Federation.
Mr. Ben Smith, London and Provincial Union of Licensed Vehicle Workers.
Mr. S. Hirst, Amalgamated Association of Tramway and Vehicle Workers.

It was also agreed that a representative of the Ministry of Labour should attend the meetings of this sub-committee.

The drafting sub-committee, after a number of meetings, prepared a scheme and submitted same to their respective Associations. Your Council made certain suggested amendments to the draft and again remitted it to the committee.

At this stage the matter was considered by a joint committee consisting of representatives of the Municipal Tramways Association and the Tramways and Light Railways Association. Whilst the representatives of the two Associations were in agreement as regards the main outlines of the scheme, a difference of view was expressed on the subject of voting on the employers' side of the council.

A proposal was put forward on behalf of the Tramways and Light Railways Association and counter proposals were made on behalf of the Municipal Tramways Association. The point in difference between the two Associations has not yet been adjusted, but it is hoped that an arrangement will shortly be come to which will meet with the approval of both Associations. The draft which your Executive Council now submits must not be taken as a final draft, because further meetings with the representatives of the tramway companies and of the employees will be necessary before the scheme

Digitized by Google

can be put forward in its final form. In submitting the scheme to the annual conference the Executive Council asks for a general approval of the steps taken so far in connection with this matter. When the scheme has received the provisional approval of the executives of the constituent associations, it is proposed to submit the same to each municipality for consideration and approval.

MEETING OF MANAGERS' SECTION.

At a meeting of the Managers' Section held at Blackpool, on September 21, 1917, it was decided that the meetings of this section should be resumed, and the next meeting be held in Birmingham. On considering this matter further, however, the Executive Council decided that in view of the difficulties of transport, catering, hotel accommodation, etc., and the numerous conferences and meetings which were being called from time to time in different parts of the country, it was not advisable to hold a meeting of the Managers' Section this year, and the members were notified accordingly.

FINANCE.

The Executive Council has to report an excess of expenditure over income during the year of £56 17s. 3d. The total income amounted to £366 16s. 3d. and the expenditure £423 13s. 6d. The great cost of printing, together with the inevitable increases on other items of expenditure, is responsible for the adverse balance. The available balance (excluding reserve fund) stands at £224 8s. 9d.

By order of the Executive Council,

SAMUEL FLINT, *President.*
J. B. HAMILTON, *Chairman.*
C. J. SPENCER, *Hon. Secretary.*

THE MAYOR'S LUNCHEON.

Delegates, members, and friends were entertained at luncheon on Thursday by the Mayor of Leicester in one of the picture galleries of the Museum. His Worship occupied the chair, and among the company were the Mayoress (Mrs. North), Mr. James Devonshire, Chairman of the Tramways (Board of Trade) Committee, Alderman S. Flint, the chairman of the Leicester Corporation Tramways Committee, and Alderman J. Benton, the vice-chairman, Mr. H. A. Pritchard, the Town Clerk, Alderman J. Russell Frears (Deputy Mayor), various members of the Leicester Tramways Committee, etc.

After the loyal toast, the MAYOR, in submitting the toast of "The Board of Trade," said they regretted the absence of Sir Albert Stanley, M.P., the President of the Board of Trade. They were very pleased, however, to have with them Mr. James Devonshire the chairman of the Tramways (Board of Trade) Committee. Many committees of that important Government department exercised considerable control over tramway undertakings, and therefore it seemed suitable that this toast should be the principal one on the list. The present occasion was obviously not one when they should criticise the department, or show any lack of enthusiasm for it in its dealings with local authorities. They were very pleased to meet the representative of the Board of Trade, and it gave him great pleasure to couple that gentleman's name with the toast. (Cheers.)

Mr. James Devonshire, who was cordially received, in responding, said he felt inclined to quarrel with Mr. Spencer, the secretary of the Association, for manœuvring him into this position, for when he entered the room he had no idea that he would be treated as the guest of the occasion by their genial host, or that he would be entrusted with the reply to such an important toast. It had been arranged that Sir Albert Stanley should have attended that day, and he believed that a message from him was on its way. Owing to the trouble on the railways, the President of the Board had been working night and day, and they could understand how difficult it was for him at such a time to leave London. Sir Albert had been very anxious to say something to them on the question which he knew had been greatly exercising all their minds, i.e., the coal situation and the rationing of coal. Dealing with that matter from a business standpoint, he knew there had been a certain amount of irritation among tramway people at being singled out for rationing of their coal supplies, while other less important industries were allowed to go scot free. He had particularly asked the President of the Board to deal with that matter in his message. All he could say for the Tramways Committee in that matter was that they were really acting under instructions. The Coal Controller's Department was under the supervision of the Board of Trade, and so was the Tramways Committee. The result of collaboration between them and the Coal Department was that it had been decided by the powers that be that there must be this rationing of coal for tramways. It was not so severe as at first blush it might seem, and he was sure they could rely with confidence on tramway administrators to act like all other patriotic citizens and do their best to economise with coal, or even to do something more. They were assured by the Coal Controller that, although as an organised industry they were easy to select for rationing, yet the very fact of their being an organised industry would redound to their advantage in the long run, because he would make it his first care that they, being an industry of great national importance, would be the last to be starved in regard to this most important commodity of coal. That was worth bearing in mind. Meanwhile he begged them to be content with things as they stood. They were asked to do their best, and it was proposed to leave the matter there until further more stringent orders were issued in due course.

Councillor Mayne (Newcastle), in the absence of Mr. H. E. Blain, operating manager of the London General Omnibus Company, proposed the toast of "The Town and Trade of Leicester." He congratulated Leicester on its municipal enterprise; for in several respects it set a wonderful example to the rest of the towns of England. He trusted its people would long continue to possess that prosperity, fairness, and freedom they had enjoyed in the past. (Applause.)

Mr. H. A. Pritchard (Town Clerk), in replying, congratulated the company in having such an excellent substitute for Mr. Blain. Those who were associated with the administration of Leicester had the welfare and prosperity of its people very near to their hearts, and in that respect they were somewhat locally centred. In modern city life a great many things went to make the amenities of the people what they should be, and he could not think of anything more decisive for the welfare and comfort of the people of a large industrial town like theirs than adequate means of transit. He did not hesitate to say that the Leicester tramways were second to none. Since the far-off days of horse cars great improvements had taken place, and as experts he thought they would agree with him that there was scope for still further improvement. Tramway enterprise had close connection with public work, and, whether run by municipalities or companies, it never lagged behind. He had many pleasant recollections of their Association, and of old friends like Mr. Hamilton, Mr. Baker, Mr. Bellamy, and many others. He had also had some little connection with their friends at the Board of Trade. British Governments always came in for a great deal of criticism; it seemed to him that the Government departments realised their responsibilities and did their best. He thought that it was an encouraging sign that practical business men were now taking charge of various departments, and they sincerely hoped Sir Albert Stanley would be able to cope with the many difficulties of the present time. The prosperity of their old town was wrapped up in the prosperity of the British Empire. They had a long history behind them, and he was optimistic enough to think they might look forward hopefully to the future. (Applause.)

Alderman J. Russell Frears (Deputy Mayor), proposing the toast of "The Municipal Tramways Association," said that in Leicester they felt that as a town they had derived great benefit from the proceedings of the Association. They were proud of their tramway system, and felt that for their many advantages they were indebted to the hard and efficient work of the tramways committee, whose members were inspired by meeting with representatives from other towns who were engaged in the same work as themselves. Such an Association as theirs enabled them to solve many difficulties in a helpful way, and to make things better for the whole country. Another thing which gave Leicester a special interest in the Association was the fact that its president was Alderman Flint. He need not praise that gentleman, because they all knew him so well, but he could say that in their Town Council none was held in higher respect and esteem than their president. He had been a most successful chairman of the Tramways Committee, and they were indebted to him for much sterling work. The committee kept steadily before them the improvement of the service, and they looked with confidence to that Association to help them in their work. (Applause.)

The President, who was received with applause, briefly responded, and on behalf of the Association warmly thanked the company for the generous reception of the toast. He assured them all that the Association keenly appreciated the way in which they had been welcomed to that town. As an organisation consisting of municipal representatives and officials engaged in the tramway administration of the whole country, they could understand the difficulties now facing the Board of Trade, and he believed they would respond to the earnest appeal made to them by Mr. Devonshire. (Hear, hear.)

Councillor Timpson, Portsmouth, proposed the health of the Mayor, whose reception and hospitality were greatly appreciated by everyone. The Mayor had taken no mean part in the civic and public life of the borough, whose head he had been continuously for the past four years. In Leicester the Mayor had raised no less a sum than £100,000 for wounded soldiers, and he believed that was a record collection. Considering, too, that the Mayor was chairman of the Education Committee, they could well understand how much time he must devote to promoting the welfare of his fellow citizens. They tendered to him their warmest thanks. (Applause.)

The Mayor briefly acknowledged the compliment. He explained the real pleasure it had given him to welcome the Association to Leicester and thanked the proposer for the too generous things said about his work. He announced that a telegram had been received from Sir Albert Stanley's private secretary expressing the President's regret at being unable to leave the Board of Trade, and adding that a further telegram had been sent to the Town Hall.

Digitized by Google

On Friday afternoon visits were paid to various places of local antiquarian interest and to several of the largest boot and shoe and hosiery manufactories, arrangements for which had been thoughtfully made by Mr. A. F. Lucas, the tramways manager.

TRAMWAYS COMMITTEE LUNCHEON.

The Chairman of the Leicester Corporation Tramways Committee entertained the conference to luncheon in the Museum Buildings on Friday at the conclusion of the annual meeting. Alderman Flint presided, and there was a large company. After the loyal toast,

Alderman BOWES proposed the health of the Chairman, whose services to the conference had been so excellent. They all recognised Mr. Flint's public spirit, and trusted that Leicester would long enjoy the advantage of his experience and ability.

The toast was accorded musical honours.

Alderman FLINT, replying, said he had been anxious to make the conference a success, and as it was being held in a very central town he felt there had been a prospect of good attendances. He believed that hope had been realised. On the whole the attendance had been very good. Personally he had been delighted with the good spirit displayed throughout the proceedings. As to the Leicester tramway system, it had been their object to make it second to none in any industrial area. Their object was to instal a good system, and then keep it thoroughly up to date. He paid a tribute to the road work of the borough surveyor, Mr. Mawbey, whose skill and successful efforts were visible in the various thoroughfares. In Mr. Lucas, the tramways manager, they had an earnest and loyal official, who played his part admirably, together with Mr. Smith, the engineer, a capable man who had charge of the power-station. He wished the members a safe return home, and expressed the hope that they had found the Leicester conference profitable as well as interesting. (Applause.)

THE NEW PRESIDENT OF THE MUNICIPAL TRAMWAYS ASSOCIATION.

The newly-elected president of the Municipal Tramways Association, Mr. Thomas Boyce Goodyer, A.I.E.E., tramways manager to the Croydon Corporation, was born in Glasgow and educated at the Royal High School, Edinburgh. On leaving school, Mr. Goodyer was several years in the office of Mr. D. W. Paterson, solicitor, for many years secretary to the Edinburgh Street Tramways Company, of which system Mr. Goodyer, sen., was traffic manager. In 1884 he joined the traffic office staff of the London Road Car Company, Limited, and some months later was appointed manager and secretary to the Northampton Street Tramways Company. His next appointment was that of manager of the West Metropolitan Tramways, part of which is now the London United Tramways. Mr. Goodyer resigned this post in order to take up, in October, 1887, the appointment of assistant traffic manager to the Birmingham Central Tramways Company, Limited. In addition to the horse car and omnibus services, the company also worked cable, electric (accumulator), and steam cars. In 1894 Mr. Goodyer was appointed traffic manager. In 1896 a new company, called the City of Birmingham Tramways Company, Limited, was formed to take over and work the "Birmingham Central," and he remained with the new company until April, 1898, when he resigned to become the general traffic superintendent of the British Electric Traction Company, Limited. In this appointment Mr. Goodyer was responsible for the general traffic arrangements on the company's numerous tramway systems, consisting of electric, steam, and horse lines, the aggregate mileage of which was about 190 miles. During 1900 he spent several months in the United States and Canada, inquiring into tramway matters. When the office of general traffic superintendent was abolished in December, 1901, Mr. Goodyer was appointed general manager at Croydon, for the British Electric Traction Company, Limited, the lessees of the Croydon Corporation Tramways, and held that appointment during the currency of the lease, which terminated in May, 1906, and since that time he has occupied his present position. He has been a member of the Executive Council of the Municipal Tramways Association for some years, and is also a member of the Council of the Tramways and Light Railways Association. Since 1907 Mr. Goodyer has been honorary secretary to the Metropolitan Association of Electric Tramway Managers, and also acts in a similar capacity to the Tramways (Board of Trade) Local Advisory Committee for No. 1 area, Metropolitan and East Coast.

Control of Electricity.—By a new regulation published in the *London Gazette* the Minister of Munitions may direct the extinction or restriction of lights at such times and places as may be specified and may prohibit or restrict the supply of electricity. It is provided, however, that no order shall be made for the closing of any power station belonging to any local authority or for the connection of any such power station with any other power station, except with the concurrence of the appropriate Government department.

GLASGOW CORPORATION TRAMWAYS.

The twenty-fourth annual report of the Glasgow Corporation Tramways Committee for the year ended May 31 last, which has recently been issued, shows that the ordinary income amounted to £1,412,635, and the working expenses, including payments to dependants of employees serving with the Forces, to £1,044,183, thus leaving a net revenue of £368,452. These figures compare with the following for the year ended May 31, 1917 :—Receipts, £1,260,115 ; expenses, £838,065. After adding interest on investments, the net revenue of £377,032 has been applied in payments to the Paisley Tramways Company, income tax, Parliamentary expenses, and an amount carried to depreciation and permanent way renewals fund. These items amount in all to £199,479 ; for the previous year they totalled £339,702. The net balance was £177,553, compared with £160,985, and under the Act of 1909 it is paid over to the Common Good. The reason why the deductions from the net revenue account are so small compared with the previous year is that, owing to the capital indebtedness having been wiped out, there are for the first time no payments to be made in the shape of interest on capital and contributions to sinking fund. It will be noticed, however, that this relief is more than swallowed up by the great increase in working expenses. These, including depreciation and payments to dependants, stand at £951,063, compared with £745,420. The increase is largely due to the enormous advances in wages which have been awarded during the year.

The following is a summary of the results for the last four years :—

YEAR ENDED MAY 31.	1918	1917	1916	1915
	£	£	£	£
Traffic receipts	1,404,110	1,245,507	1,149,264	1,070,694
Sundry receipts	8,525	14,607	8,072	6,183
Total revenue	1,412,635	1,260,114	1,157,336	1,076,877
Traffic expenses	527,152	395,736	350,186	345,625
General expenses	156,949	137,816	144,297	142,020
Maintenance and repairs	179,811	143,758	133,659	144,530
Power expenses	86,019	67,231	64,346	51,995
Clydebank bridges	1,132	879	516	—
	951,063	745,420	693,004	684,170
European war	93,120	92,645	80,438	51,817
Total expenditure	1,044,183	838,065	773,442	735,987
Balance carried to net revenue account...	368,452	422,049	383,894	340,890
Dumbarton tramways	—	—	—	126
Interest on investments	8,580	78,637	81,203	65,701
Total	377,032	500,686	465,097	406,717
Deductions—				
Rent of Paisley lines	11,119	8,453	6,700	5,559
Interest on capital	—	78,846	90,474	78,797
Sinking fund	—	114,378	109,614	105,492
Income tax	64,405	64,622	39,853	22,790
Parliamentary expenses	61	98	500	8,818
Renewal and depreciation	123,894	73,305	174,408	172,310
Total	199,479	339,702	421,549	393,766
Surplus to Common Good	177,553	160,984	43,548	12,951

The following are the traffic statistics for the year 1917-18 :—Average track mileage open single, 196¼ ; car mileage, 26,261,231 ; increase 475,184 ; traffic receipts, £1,404,110, increase £158,602 ; traffic receipts per car mile, 12·832d., increase 1·240d. ; traffic receipts per passenger, ·782d. increase ·13d. ; passengers carried, 430,946,566, increase 42,651,690 ; passengers per car mile, 16·410, increase 1·351.

FINANCIAL REPORTS AND MEETINGS.

BRITISH INSULATED AND HELSBY CABLES, LIMITED.—An interim dividend of 9d. per share, less income-tax, has been announced.

STRAKER-SQUIRE, LIMITED.—An interim dividend of 1s. per share, less income-tax, on account of the current year, has been announced.

BRITISH INSULATED AND HELSBY CABLES, LIMITED.—An interim dividend on the ordinary shares has been declared at 3½ per cent. (9s. per share), less tax.

TYNESIDE TRAMWAYS AND TRAMROADS COMPANY.—A dividend of 2½ per cent. has been paid for the past half-year, £3,600 has been carried to reserve, and £1,696 carried forward.

MADRAS ELECTRIC TRAMWAYS (1914), LIMITED.—An interim dividend in respect of the year ending December 31st next of 8 per cent. per annum, free of tax, on the ordinary shares has been announced.

HONG KONG TRAMWAY COMPANY, LIMITED.—The attorneys in London have received telegraphic advices from Hong Kong that the Board of this company intends to redeem all the outstanding debentures on May 31 next.

Digitized by Google

BARSI LIGHT RAILWAY COMPANY.—After transferring £1,035 to reserve account for the equalisation of dividends, etc., a final dividend of 3 per cent. (6s. per share), making a total distribution of 6 per cent. for the year to March 31, has been paid.

THE BRITISH EMPIRE TRUST COMPANY, LIMITED, announce that the Toronto Railway Company has declared a dividend on its ordinary shares of 1 per cent. for the quarter ended September 30, 1918, being at the rate of 4 per cent. per annum.

BRITISH ALUMINIUM COMPANY, LIMITED.—Dividends have been declared at the rate of 8 per cent. per annum, less income-tax, on the ordinary shares, and 6 per cent. per annum, less income-tax, on the preference shares, both for the six months ended June 30.

ABERDEEN SUBURBAN TRAMWAYS COMPANY.—For the half-year to July 31 the net profits amounted to £2,300, and £1,614 was brought forward. A dividend at the rate of 5 per cent. per annum has been declared, £1,200 has been added to the depreciation fund, and £1,061 is carried forward.

BROCKHOUSE AND COMPANY.—This year, as in the previous year, an ordinary dividend of 20 per cent. is to be paid. A further proof of the vigorous state of business is that more capital is needed to finance extensions, and that the ordinary shareholders are accordingly invited to double their holdings by subscribing for 57,000 more ordinary £1 shares at a premium of 50 per cent.

SWANSEA IMPROVEMENTS AND TRAMWAY COMPANY.—The 79th annual report states that the revenue for the year amounted to £79,753, or an increase of £7,411 as compared with 1916. Of the available balance it is proposed to place £3,000 to reserve, payment of preference dividends absorbs £2,598, and a dividend at the rate of 6 per cent. for the year is recommended on the 13,000 ordinary shares, in respect of which an interim dividend at the rate of 5 per cent. per annum for the half-year was paid in October last. This absorbs £7,800; the carry-over is £2,654, or slightly more than the sum brought into the account.

BIRKENHEAD CORPORATION TRAMWAYS.—The seventeenth annual report for the financial year ended March 31 states that the income was £97,837 16s. 5d., or £17,090 3s. 3d. higher than the previous record made during the preceding twelve months. The traffic receipts, £96,386, showed an increase of £16,714, and the parcel receipts £206, an increase of £7. The total working expenses amounted to £53,815, an increase of £11,708. The available balance of £17,372 has been allocated as follows:—In aid of rates, £8,550; reserve fund, £3,822; renewals fund, £5,000. The credits to reserve fund now stand at £12,013, and to renewals fund £39,338. The war bonus at present being paid to employees of the department was at the rate of £12,800 per annum. War allowances to dependants of employees on active service amounted to £998 8s. 9d., making a total since the war commenced of £4,996 7s. 4d. The passengers carried for the past year were 20,538,476, being an increase of 2,588,043 over the previous year, and an increase of 5,370,518 over the pre-war year. These figures did not include the large number of wounded sailors and soldiers who were allowed full use of the cars without charge. The effect of the withdrawal of the 1½d. stages in June, 1917, showed that, whilst there was a loss of 1,720,645 passengers at 1½d., there was an increase of 2,114,138 passengers at 2d.

Birmingham Corporation Tramways.—Appended is a comparative statement of the financial results, together with other details of the working, of these tramways for the year ended March 31, 1918, and the three preceding years:—

YEAR ENDED MARCH 31.	1918	1917	1916	1915
	£	£	£	£
Income—				
Traffic revenue	984,287	832,052	765,036	640,091
Sundry receipts	6,137	6,673	6,081	6,923
Total income ...	990,424	838,725	771,117	647,014
Expenditure—				
Power	163,646	159,228	127,986	113,375
Traffic	306,936	231,512	201,651	187,946
General	91,729	87,001	76,123	66,387
Repairs and maintenance ...	159,679	116,190	88,770	86,067
War allowances	31,820	36,060	37,629	17,967
National Insurance, etc. ...	2,370	2,174	1,920	2,137
Total working expenses	755,980	632,165	534,079	473,879
Gross profit—Tramways ...	234,444	206,560	237,037	173,135
Gross profit—Motor 'bus accnt.	*13,212	10,085	10,213	4,550
Total gross profits ...	247,656	216,645	247,250	177,685
Interest and sinking fund ...	145,956	140,354	139,501	130,089
Reserve fund	63,899	66,206	57,749	17,596
Suspense account	12,801	10,085	—	—
Relief of rates	25,000	—	50,000	30,000
Mileage of track	123·25	123·25	123·25	118·75
Passengers carried	198,402,908	171,445,020	163,258,584	149,443,199
Car mileage	14,677,628	14,223,007	14,151,683	14,232,902
Units per car mile	1·9	2·002	1·9	1·7
Power cost per car mile ...	2·676d.	2·687d.	2·170d.	1·912d.
Traffic receipts per car mile ...	16·094d.	14·040d.	12·974d.	10·793d.
Expenses per car mile ...	12·361d.	10·667d.	9·057d.	7·991d.
Ratio of expenses ...	76%	76%	69%	73%
Number of cars in stock ...	585	585	585	550

* Includes £411 motor garage account.

PERSONAL.

Sir Alexander Roger has been elected a director of the British Insulated and Helsby Cables, Limited.

Mr. W. H. Brown, secretary of the Metropolitan Railway Company, has been made a Justice of the Peace for Middlesex.

Mr. H. T. Wakelam, county engineer of Middlesex, has been appointed a member of the Road Transport Board.

Mr. W. J. Hadfield, permanent way engineer to the Sheffield Corporation Tramways, has been appointed local fuel overseer.

Driver W. H. Spencer, R.F.A., formerly a conductor on the Bradford Corporation Tramways, has been awarded the Military Medal.

Mr. H. Yarwood, assistant borough surveyor of Rochdale, has been appointed borough surveyor *pro tem.* at a salary of £400 a year.

Mr. H. J. Burcham has been appointed rating agent to the London and North Western Railway, in place of the late Mr. W. C. Neate.

Mr. A. B. Slater, manager of Burton-on-Trent Corporation Tramways, has been granted an increase in salary of £50 and war bonus.

Mr. B. S. Pinkerton, permanent way engineer of the Belfast Corporation Tramways, has been appointed assistant city surveyor of Belfast.

Mr. W. Clough, general manager of Bury Corporation Tramways, has been appointed honorary secretary of the Municipal Tramways Association.

Mr. H. Webber, borough electrical engineer and tramways manager of Keighley, has been appointed district engineer by the Controller of Coal Mines.

Mr. A. R. Dayson, general manager of the Sunderland Corporation Tramways, has received an increase of salary from £600 to £700 per annum.

Lieut. L. F. Burgess, of the staff of the British Westinghouse Electrical and Manufacturing Company (Australia), has been awarded the Military Cross.

Sergt.-Major J. H. Jones, formerly a driver on the West Ham Corporation Tramways, has been awarded the D.C.M., having previously received the M.M.

Mr. John Baker has been elected to the executive committee of the Industrial Reconstruction Council, as representing the Iron and Steel Trades Confederation.

Professor W. E. Dalby, F.R.S., has consented to serve on the expert sub-committee of the Gas Traction Committee in place of the late Colonel Bertram Hopkinson.

Mr. A. J. Griffin has resigned his position as engineer in charge of the West Ham Corporation power-station, to take up an appointment with the Western Electric Company.

Mr. H. E. Mortimer, of the Croydon Corporation electricity department, has been appointed assistant mains engineer to the Marylebone Borough Council electric supply department.

Mr. S. S. Platt, late borough surveyor of Rochdale and permanent way engineer to the Rochdale Corporarion Tramways, is being retained as consulting engineer at a salary of £200 a year.

Mr. James Taylor has been elected chairman of the British Insulated and Helsby Cables, Limited, following the resignation, owing to health reasons, of Dr. E. K. Muspratt, who, however, remains on the directorate.

Mr. R. L. Horsfield, general manager of Walsall Corporation Tramways, has been granted by a unanimous vote of the Council an increase in salary of £100 as from April 1, to £600, and an increase of £50 in each of the two succeeding years, to £700.

Mr. Struan Robertson has been appointed engineer and manager of the Hawthorn Tramway Trust. Since 1914 he has been engineer and manager of the Melbourne, Brunswick and Coburg Tramway Trust, whose undertaking he designed and constructed.

Private T. Temple, M.M., Grenadier Guards, is the fourth Cardiff Corporation tramway employee who has won distinction in the war. He has been presented with a watch, chain and pendant by the employees at a gathering at which Mr. Arthur Ellis, general manager, presided.

Mr. J. E. Edgcome, borough electrical engineer of the Corporation of Kingston-on-Thames for the past twenty-five years, has resigned to take up the post of secretary of the Tungsten Lamp Association. Mr. Edgcome was selected from more than one thousand applicants.

Mr. Charles Challenger, manager of the Bristol Tramways and Carriage Company, has entered upon the fiftieth year of his connection with the passenger transport industry. After a few years' service with the Midland Railway Company, he joined the staff of the enterprise of which he is now the manager.

Mr. Robert N. Tweedy, on receiving a commission in the R.A.F., A.G.S. branch, has resigned his position as manager of the Dublin and South of Ireland branch of William Coates and Sons, Limited, which he has held for nearly twelve years. He will have charge, under the C.O., of the power and lighting installations of all the aerodromes in Ireland.

Digitized by Google

Mr. A. R. Green, only son of Mr. W. J. Green, manager of the Weston-super-Mare branch of the Bristol Tramways Company, has been gazetted a lieutenant in the Royal Air Force. Before the war he was in the electrical department of the Bristol Tramways. He has served in Egypt for over two years in the Army Service Corps (Motor Transport).

Capt. F. W. Mozley, R.E., who recently received his promotion from the rank of lieutenant, is the son of Mr. H. Mozley, manager of the Burnley Corporation Tramways. He joined the Artists Rifles in December, 1915, and after ten months' training entered the Royal Engineers' Cadet School at Newark. He was commissioned on October 21, 1916, and went out to France in January, 1917. Before joining the army he was chief engineering assistant under Mr. Shackleton, permanent way engineer to the Nelson Corporation Light Railways.

Mr. R. H. Wilkinson, tramways manager and engineer for the Huddersfield Corporation, has been appointed general manager of the Bradford Corporation Tramways, at a salary of £800 per annum. Mr. Wilkinson, who has been at Huddersfield for 14 years, was previously manager of the Oldham Corporation Tramways for four years, and had two years' service in the Liverpool tramways department. He has had mechanical, electrical, and marine engineering experience. His application was one of 19 of which four were selected for special consideration.

Mr. Albert Vickers resigned the chairmanship of Vickers, Limited, on September 16, his eightieth birthday. In a letter conveying his resignation, Mr. Vickers recalls that he has spent sixty-four years of his life with the company, and that its fortunes have always been bound up with his own. Although Mr. Vickers felt compelled, owing to advanced age and somewhat failing health, to resign the chairmanship, he said that he would always be at the service of his colleagues for consultation and advice. Mr. Douglas Vickers has been appointed chairman.

Mr. R. Stuart Pilcher, who has entered on his duties as general manager of the Edinburgh Corporation Tramways, has received a presentation from the employees of the Aberdeen Corporation Tramways, where he was manager for the last twelve years. Among those present on the occasion who spoke in appreciation of Mr. Pilcher's services were the Lord Provost (Sir James Taggart); Councillor Robertson, chairman of the Tramways Committee; Mr. A. Wilkie, manager of the Aberdeen Suburban Tramways Company; and Mr. W. Forbes, who succeeds in the management of the Aberdeen Corporation Tramways. Presentations were also made to Mrs. Pilcher and Miss Pilcher.

Mr. W. Forbes has been appointed general manager of the Aberdeen Corporation Tramways at a salary of £450. In recommending his appointment to the Council, Councillor Robertson (chairman of the Tramways Committee) said Mr. Forbes had had considerable experience not only as an organiser but in commercial work. He was a very fitting official to take the place of the late manager, Mr. Pilcher, who had given him a very high certificate. The Lord Provost (Sir James Taggart) said that the Town Council were anxious, when they had a man of their own qualified to fill a vacant position, as far as possible to promote him to that post, and they were very fortunate in having Mr. Forbes, who had been traffic manager for several years.

L.-Bombdr. H. W. Hammond, son of Mr. W. E. Hammond, traffic manager of the Metropolitan Electric Tramways, Limited, and vice-chairman of the Metropolitan Association of Electric Tramways Managers, who joined the R.G.A. in October, 1916, and was sent to Hong Kong (where he has been acting as master gunner's assistant), has been seconded to the Kowloon Canton Railway Company for temporary appointment as traffic inspector on the British section of the line. L.-Bombdr. Hammond joined the staff of theMetropolitan Electric Tramways, Limited, in September, 1904. He was transferred in March, 1913, to the British Electrical Federation, and three years later again transferred to the London Electric Railways, both appointments being in the claims departments.

Alderman V. Fowler, a director of the Scarborough Tramways Company, died recently at the age of 69. He had been Mayor of Scarborough.

We deeply regret to record the death from wounds of **Lieutenant Leonard G. Byng, M.C.,** Grenadier Guards, second son of the late Mr. J. Byng, and a director of the General Electric Company.

The death is reported of **Mr. S. A. Mahood,** who was for many years with the Brush Electrical Engineering Company, and later with the Birmingham and Midland Tramways Joint Committee as resident engineer at Smethwick Power House. He was 60 years of age, and leaves a widow and one son, who is a lieutenant in the Royal Engineers.

Extension at Burton-on-Trent.—The Tramways Committee have decided that the tramways be extended from the terminus on the Branstone Road to the Leicester Line Railway Bridge at a cost of about £3,500.

TRAMWAY AND LIGHT RAILWAY NOTES.

ABERDARE.

STRIKERS' CLAIMS TO BE CONSIDERED.

The tramway employees, who, with other employees of the Aberdare Urban Council, were on strike, have resumed work on the understanding that their claims shall be considered by the local Conciliation Board.

BANFF.

LIGHT RAILWAY PROJECTS.

The Banff Town Council have decided to associate with neighbouring Town Councils and with the County Council in support of projects for the construction of light railways from Banff to places in the county.

BRADFORD.

INCREASED COST OF ENERGY.

The increased cost of production of electricity has prompted the Shipley Urban Council to make application for an increase in the rate of payment for electricity supplied for use on tramway lines worked by the Bradford Corporation. The Bradford Tramways Committee has recommended the City Council to raise the present rate of payment by 20 per cent., which is the same increase as has been made by the Corporation Electricity Department in the charge for current supplied by them for the working of the tramways.

BIRMINGHAM.

THE ROAD WIDENING AND SLEEPER TRACK TRAMWAY SCHEME.

A reference to the scheme for widening all the main arterial roads of Birmingham to a minimum of 110 ft. or 120 ft. is contained in the annual report of Mr. H. E. Stilgoe, the city engineer. The proposal was approved by the Corporation on January 8 last, and it provides for the widening of 43 miles of radial main roads and the construction of seven miles of new roads. A further provision is for a tramway on sleeper track, with a carriageway and footway on either side. Mr. Stilgoe remarks that the project is the greatest and most complete scheme of arterial road improvement ever adopted in this country, and that it will have a far-reaching effect, not only in dealing with ordinary traffic of a great manufacturing district, but by providing facilities for quick-moving traffic and the construction of tramways on independent sleeper tracks it will be of great assistance in solving the housing problem by facilitating the development for building purposes of land near the outskirts of the city.

DEWSBURY.

INCREASED FARES EXPLAINED.

In reply to a letter from the Dewsbury Chamber of Commerce objecting to the increase of the fare on a particular route from 1d. to 1½d., the secretary of the Yorkshire (Woollen District) Electric Tramways, Limited, wrote that by the large increase in wages and the high prices of materials the cost of operating the tramways was enormously increased, and that any alteration in fares of an upward tendency was naturally objected to by those whom it affected, but while the same people paid a much higher price for amusements and for luxuries, they at once protested if an additional halfpenny was asked for on the tramways.

DUBLIN.

EMPLOYEES' CLAIMS.

The Dublin branch of the Amalgamated Association of Tramway and Vehicle Workers have adopted a programme of improved working conditions. Their claims include the abolition of split duties; one day off in the week, or a fortnight's holiday with pay; 54 hours to constitute a week's work; recognition of the Union, etc.

EDINBURGH.

QUEENSFERRY TRAMWAY SCHEME WITHDRAWN.—PREPARATIONS FOR THE TRANSFER OF THE TRAMWAYS TO THE CORPORATION.

Edinburgh Town Council, by a majority of 21 to 13, have decided to withdraw for the time being the Queensferry tramway scheme, the main reason for this being that they have been unable to come to terms with the Admiralty to gain the latter's support. At the same time the Council recorded its opinion that such a tramway was necessary, and should be provided as an extension of the Corporation tramways. Various matters connected with the arbitration on the transfer of the system to the Corporation, which will take place in June next have been remitted to the Town Clerk. The Tramways Committee have recommended the Corporation to join the Municipal Tramways Association. They have also sanctioned the attendance of the general manager, Mr. R. S. Pilcher, at all Tramways (Board of Trade) Scottish Advisory Committee's meetings. A sub-committee is to deal with the question of offices for the tramway department.

GLASGOW.

FATAL ACCIDENT TO DRIVER.

A driver of the Glasgow Corporation Tramways, noticing that the trolley had slipped from the wire, jumped off the car, which was stationary in the depot at the time, to replace it. Apparently he had omitted to turn off the power and apply the brake, because

Digitized by Google

immediately the trolley touched the wire the car moved forward, and he was knocked down and run over before the car was brought to a standstill by an employee who witnessed the accident.

MIDDLESBROUGH.

PROPOSED TRAMWAY PURCHASES.

Middlesbrough Corporation have decided to purchase the Middlesbrough, Stockton and Thornaby Tramways Company's system in their borough. The Stockton and Thornaby Corporations propose to purchase jointly the portions of the same undertaking which are situate in their areas.

NOTTINGHAM.

STRIKE AVERTED.

A strike of about two hundred members of the Amalgamated Association of Tramway and Vehicle Workers employed by the Nottingham Corporation was averted by the decision of the employees to remain at work pending arbitration.

PAISLEY

COMPANY'S CLAIM ON COUNCIL.

The Paisley District Tramways Company have written to the Paisley Town Council claiming £350 compensation for loss held to have been sustained owing to a breakdown in the power supply and consequent disorganisation of traffic.

POOLE.

DISSATISFACTION WITH BOURNEMOUTH'S SERVICE.

Owing to recent reductions, the Poole Town Council are dissatisfied with the tramway service of the Bournemouth Corporation in their borough, and have decided, failing improvement, to make representations to the Board of Trade.

SHEFFIELD.

EXPLOSION DUE TO LEAKAGE.

Two street explosions occurred in Sheffield recently owing to the failure of an underground tramway cable allowing the current to leak to earth, with the result that the temperature in the cable-box was raised, and the expansion forced the heavy metal cover off the box at two points. In one case the explosion was so violent as to disturb some of the stone setts of the roadway and the flagstones of the pathway. The explosions were followed by an underground fire, caused by the cable insulation becoming ignited.

TYNEMOUTH.

PROPOSED TRAMWAY ACQUISITION.

Tynemouth Town Council propose to promote a Bill in the next Session of Parliament for taking over the tramway system of the Tynemouth and District Electric Traction Company, and to obtain powers for running railless cars along routes to be agreed upon.

WORCESTER.

WIND SCREENS FOR CARS.

The Worcester City Watch Committee have received letters from the Worcester Electric Traction Company in regard to the provision of wind screens at both ends of the cars. The company intimated that the directors only agreed to provide screens in view of the strong pressure put upon them by the Watch Committee. They further stated that sickness among members of the staff was greater on cars where screens had been provided than where there were no screens, and that the drivers were quite satisfied with the arrangements made by them.

CONTRACTS AND ORDERS.

Stewarts and Lloyds, Limited, have obtained a contract for supplying to Salford Electricity Committee elbow pipes for boilers.

British Thomson-Houston Company's tender for tramway motors has been accepted by Manchester Corporation.

British Westinghouse Company, Limited, have successfully tendered for the supply of consumers' switchgear to Walsall Corporation.

British Insulated and Helsby Cables, Limited, have obtained a contract for supplying cable to South Shields Electricity Committee.

Glasgow Tramways Committee have recommended that orders be placed with the Carron Company for track brakes, with Thomas Bolton and Sons, Limited, for trolley wire, and with the B.I. and Helsby Cables, Limited, for lead-covered cable.

A "Safety First" Poster.—One of the latest of the series of useful posters issued by the London "Safety First" Council, calls the attention of drivers, cyclists, and pedestrians to a variety of unusual accidents which sometimes happen. Illustrations and descriptions of the circumstances in which such accidents occur are subjoined to several bold introductory headlines. An award has been instituted by the Council, known as the "London 'Safety First' Meritorious Service Award," to be presented in recognition of conspicuous instances of acts which have resulted in the prevention of accidents in streets, factories, schools, etc., or on railways, within a radius of 20 miles of Charing Cross. The award will consist of a badge, a diploma, and an honorarium.

PATENT LIST.

Abstracted for "The Tramway and Railway World" from the Official Journal of Patents.

*** If the inventions have been communicated the names of the communicators are given in italics.

APPLICATIONS FOR LETTERS PATENT.

The number of the patent is given in brackets.

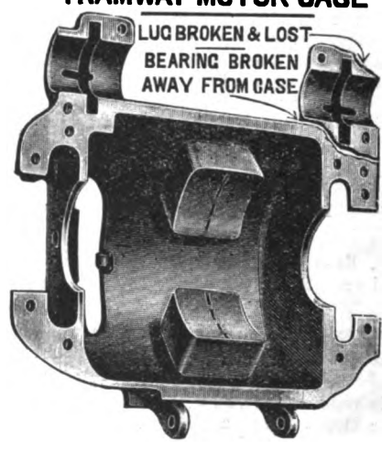
Driving gear for speedometers, etc. (13,877)—P. O. Dorer and S. Smith and Sons.
Trolley heads of electrical vehicles (13,975)—H. Dowden and J. J. Sampson.
Railway joints (14,142)—F. J. Harkin.
Lifting jacks (13,935)—W. Matthewman and E. Sandow.
Appliance for engaging overhead conductor with trolley sheave of electric cars (14,155)—W. H. Simmonds.
Wheel tires and brake shoes (13,939)—T. C. Way.
Signalling apparatus (14,567)—British Thomson-Houston Company (*General Electric Company*).
Transmitting and controlling motion in motor-driven vehicles, etc. (14,430)—T. F. Evans.
Chair for holding rails (14,391)—D. John.
Variable transmission gearing (14,503)—L. R. Jones.
Driving and steering wheels (14,330)—C. M. Motte.
Automatic braking apparatus for motor car trailers (14,529)—A. E. C. Paris.
Direct variable gear (14,561)—W. Sheehan.
Driving gear for motor vehicles (14,294)—G. Woodvine.
Signalling systems (14,703)—T. W. Case.
Steel keys for sleepers (14,779)—J. E. Davies (*P. Clewes*).
Repair of axles of motor vehicles (14,788)—E. Hodges.
Motor vehicles for road or rail (14,892)—C. Hyland.
Change-speed gear (14,603, 14,604, and 14,770)—S. Bramley-Moore.
Epicyclic change-speed gear (14,772)—E. Reeve and Wolseley Motors, Limited.
Resilient self-driving wheel for highway and railroad conveyances (14,749)—L. E. Stephens.
Brakes for railway and road vehicles (14,754)—S. T. Tregaskes.
Steering mechanism for vehicles (14,945)—E. Jensen-Valeur.
Variable speed friction gears (15,033)—G. Barker.
Car stopping and holding mechanism (15,117)—A. Barraclough.

REPAIRS

We are specially laid out to deal Promptly with All Kinds of Welding Repairs in Steel, Wrot or Cast Iron, Aluminium or its Alloys, by the Latest Oxy-Acetylene and other Special Processes.

Broken Bearings Welded, New Lugs Added, Worn Pl·ces Refilled, and generally speaking USELESS CASES MADE USEFUL

TRAMWAY MOTOR CASE



EXAMPLE OF REPAIRS TO MOTOR CASE.

Repairers to over Forty Corporations. May we ask you to send us a trial order? We can save you money right along the line.

MAJOR, ROBINSON & CO. LTD.
Sykes Street, Chester Road, MANCHESTER
'Phone 5008 Central

Digitized by Google

STEAM AND HYDRAULIC
ENGINE PACKING
MANUFACTURERS
(Flax, Asbestos and Cotton)
And all Engine Room Stores
ATTWATER & SONS
Hopwood Street Mills, PRESTON
Telegraphic Address: "Attwaters, Preston."

STEAM CONDENSING PLANT.
VACUUM PUMPS AND EVAPORATORS.
MIRRLEES WATSON
THE MIRRLEES WATSON CO. LTD., GLASGOW

TROLLEY HEAD SLINGS
Trolley Head Slings 18" long by 3/16" diameter. Best Flexible Steel Wire Rope Galvanised, Loop-spliced in each end to take ½" bolt, and seryed with Galvanised Wire. Price 12/- per dozen nett (in Gross Lots). Sample on Application.
C. OSBORNE, 97 South Street, Longsight, MANCHESTER

ENGINEERING firm with up-to-date plant and special facilities for turning out repetition work, are prepared to consider the manufacturing rights of patented specialities for sale amongst tramway and electrical undertakings.
Box No. 58, The Tramway and Railway World, Amberley House, Norfolk Street, London W.C.2

'TRIPLEX' SAFETY GLASS
The Only Glass that cannot Splinter. A vital necessity for all purposes where perfect vision and absolute safety are essential. Catalogue free.
THE 'Triplex' Safety Glass Co. Ltd.
(Reginald Delpech, Managing Director)
ALBEMARLE STREET, LONDON W.1
CONTRACTORS TO H.M. GOVERNMENT

Apparatus for supplying engines of motor vehicles with acetylene (15,332)—E. Küng.
Suspension and power transmission mechanism for automobile vehicles (15,099)—F. W. Lanchester.
Jacking apparatus for vehicles (15,779)—G. Bowman and E. Graham.
Motor vehicles (15,688)—H. Burridge.
Jack for motor cars, etc. (15,645)—W. F. Cottrell.
Gearless variable speed transmission (15,692)—W. Dunn.
Rail joints and chairs (15,707)—J. Frecska and Z. Frecska.
Variable speed gear (15,470)—A. G. M. Jack.
Engine starters for motor vehicles (15,721)—A. Jackson.
Speed change mechanism (15,792)—E. Maillard.
Variable speed transmission gear, etc. (15,711)—J. V. Nash.
Wheel tire and run for motor vehicles, etc. (15,804)—J. M. Parker.
Damper for laminated springs of motor vehicles (15,583)—C. D. Peach.

SPECIFICATIONS PUBLISHED.

1916.

Electric traction systems (8,166—*102,923*)—Ateliers de Constructions Electriques du Nord et de l'Est.

1917.

Tramway systems and transporting goods thereon (10,859—*117,835*)—P. Kenyon.
Brake mechanism for vehicles (11,304—*117,850*)—Birmingham and Midland Counties Transport Company and G. E. D. Ralls.
Wheels for railway and tramway vehicles (11,553—*117,954*)—C. Hyland.
Self-acting mechanical brake for railway and tramway vehicles (11,586—*117,956*)—T. Grey and T. M. Williams.
Speed indicators (11,681—*117,960*)—J. W. Robinson.
Speed indicating and distance measuring apparatus (11,576—*118,143*)—L. E. Cowey.
Steering mechanism for motor vehicles (11,913—*118,158*)—W. Ellis.
Anti-friction rail wheels (13,134—*118,171*)—H. N. Barnes and E. Pollard and Company.
Collapsible gas-holders for use in connection with motor-driven vehicles (13,641—*118,176*)—United Automobile Services, Limited, and J. C. Jolly.
Mechanically-operated pump for the inflation of tires of motor vehicles and the compression of coal or other gas used in the propulsion of such vehicles (16,611—*118,198*)—T. B. Gibson.
Repeating accelerator for compressed air brakes (18,217—*112,932*)—Soc. Generale des Freins Lipkowski.
Speed-changing and reversing gear (11,712—*118,308*)—G. Pollard and Menco-Elma Syndicate.
Motor vehicles (12,096—*118,326*)—Coventry Premier, Limited, and G. Funck.
Apparatus for storing coal gas in motor vehicles (12,151—*118,327*)—G. P. Ottini.
Speed-changing and reversing gear (12,273—*118,444*)—G. Pollard and Menco-Elma Syndicate.

1918.

Spring suspension for motor vehicles (6,820—*115,831*)—Lancia and Company.
Variable speed gear (9,460—*117,900*)—G. Taylor.
Electric starting apparatus for motor vehicle engines (617—*118,050*) and 616—*118,220*)—H. Lucas and C. L. Breeden.
Electric relays particularly for traffic controlling apparatus (2,907—*113,615*)—McKenzie, Holland and Westinghouse Power Signal Company.
Electrical starting and lighting systems for automobile vehicles (1,277—*118,221*)—J. Bethenod.
Speed indicators for vehicles (3,339—*113,788*)—H. Meyer.
Rail joints (5,042—*118,242*)—E. Henderson and J. Henderson.
Lifting apparatus for motor road vehicles, etc. (7,266—*118,257*)—F. Coultas and A. Pick.
Gear-shifting mechanism (883—*118,547*)—H. Wade (*Vulcan Motor Devices Company*).

"Key" Industries Exhibition.—Mr. H. J. Mackinder, M.P., chairman of the Tariff Reform League, opened (in the absence, owing to indisposition, of Mr. Austen Chamberlain, M.P.) an exhibition of new British and "Key" Industries, organised by the Industrial Section of the League, at the Central Hall, Westminster, London, on October 7. The exhibition continues to October 22, after which it will be shown in Manchester and other leading provincial centres. Active co-operation and assistance had been secured from important firms interested in the industries concerned, many of whom contributed valuable exhibits and expert information. The exhibition, which was arranged with the sanction of the Ministry of Munitions, covered a wide range of articles, prominent among which were samples of the British magneto industry and a variety of rubber products.

Parcel Rates at Bradford.—On consideration of report of the general manager on the results of operation of the Parcel Department for the year ended March 31 last the Tramways Committee of the Bradford Corporation recommend that the advance of 25 per cent. in parcel rates, sanctioned by the Council on October 10, 1916, be increased to 50 per cent.

Digitized by Google

TRAFFIC RETURNS.

Tramway and Omnibus Undertakings in the United Kingdom.

NAME OF COMPANY OR CORPORATION.	1917. WEEKS ENDED.					1918. WEEKS ENDED.					AGGREGATE.		
	Sept. 8.	Sept. 15.	Sept. 22.	Sept. 29.		Sept. 7.	Sept. 14.	Sept. 21.	Sept. 28.		Wks.	1918.	Increase or Decrease.
	£	£	£	£	£	£	£	£	£	£		£	£
Aberdare U.D. Council	435	449	456	441	...	512	507	157	524	...	24	12,654	—
Aberdeen Corporation	2,401	2,205	2,178	2,216	...	2,774	2,591	2,604	2,714	...	17	45,999	+ 8,009
Ayr Corporation	456	447	421	562	..	655	573	501	528	...	19	15,110	+ 3,444
Belfast City	...	...	...	...	...	...	...	...	...	...	—	—	—
Birkenhead Corporation	2,263	2,003	1,903	1,960	...	2,336	2,256	2,364	2,353	...	26	58,071	+ 9 622
Blackburn Corporation	1,521	1,778	1,788	1,492	...	1,673	1,953	1,954	1,827	.	26†	49,614	+ 8,977
Bradford Corporation	8.396	8,032	7,603	7,940	...	9,919	9,157	9,600	9,706	...	26	240,863	+ 38,199
Burnley Corporation...	2.222	2.224	1.927	1.927	...	2,361	2,436	2 345	2,426	..	—	—	—
Burton-on-Trent Corporation ...	418	326	340	329	...	327	420	422	412	...	26	10,887	+ 2.842
Bury Corporation	1.977	1,736	1 683	1,738	...	2,263	1,881	2.190	2,083	...	26	54,834	+ 9,995
Chatham and District	1.530	1,429	1.396	1,299	...	1,498	1,450	1.454	1,382	...	39	50,667	— 205
Cork Electric	636	626	611	598	...	669	680	618	600	...	39	24,327	+ 2,965
Derby Corporation	1,273	1,245	1.255	1.260	...	1,549	1,513	1,505	1,512	...	26	39.766	+ 8,099
Dundee City	1,697	1.640	1.598	1,576	...	2.066	1,976	1,961	1,984	...	19	37,636	+ 7,628
East Ham Corporation	1,469	1,481	1,491	1,385	...	1.682	1,531	1.683	1.710	...	25†	40,436	+ 3,016
Glasgow Corporation	27,170	27,615	27,124	27,394	...	29,972	29,820	29,114	29,254	...	17†	495,816	+ 43,056
Glossop (Urban Elec. Supply Co.)..	186	186	183	178	...	167	167	165	176	...	39	7.097	+ 1,184
Halifax Corporation	2,757	2,817	2,558	2.431	...	3,242	3,094	2,634	2,974	...	25‡	73,517	+ 7,555
Halifax Corp. Motor Omnibuses ..	52	55	54	54	...	79	73	68	73	...	25‡	1,699	+ 459
Huddersfield Corporation	4,578	3,218	3.210	3,449	...	4.450	3,900	3,872	3,867	...	26	97,969	+ 11.786
Ilford U.D. Council	838	809	836	739	...	1,075	1,025	1,029	1,074	...	26	26,614	+ 6,172
Ipswich Corporation	868	799	790	728	...	880	841	900	794	...	26	21.311	+ 2.694
Isle of Thanet	448	373	309	240	...	865	659	624	460	...	52	16.528	+ 199
Kilmarnock Corporation	217	205	204	206	...	272	271	277	274	...	19†	4.988	+ 1,117
Lanarkshire	3,007	3.067	3,124	3.177	...	3,960	3,956	3,804	3,740	...	39	138.103	+ 30,985
Lancashire United	...	...	...	...	...	...	...	...	...	...	—	—	—
Leeds City	11,791	11,582	11,233	11,326	...	14.681	13,890	14,097	14,522	...	26	348.362	+ 60,825
Leicester Corporation	3,921	3,937	4,011	3,941	...	4,707	4,783	4,723	4,774	...	—	—	—
Leyton U.D. Council	2,033	1,927	1.997	1,900	...	2,498	2,436	2,478	2,580	...	26	60,763	+ 9,798
Liverpool Corporation	16,920	16,757	16,368	16.290	...	19,043	18,889	18,889	19,583	...	38†	701,043	+101,768
Llandudno and Colwyn Bay ..	722	610	560	450	...	855	850	672	562	...	43	20,457	+ 4.855
London County Council	59,222	57,560	58,823	57,834	...	68,503	67,486	67,802	69,071	...	25‡	1,659,072	+226,756
Maidstone Corporation	282	284	295	269	...	321	294	329	294	...	25†	7,579	+ 1,013
Manchester Corporation	21,692	21,497	21,118	21,273	...	26,954	26,477	26,698	27,047	...	26	673,411	+132,380
Newcastle-on-Tyne Corporation ..	8,184	8,191	8,196	8,180	...	9,345	9,177	9,316	9,460	...	26	238,641	+ 36,917
New St. Helens and District ..	...	...	...	...	...	...	...	...	...	...	—	—	—
Northampton Corporation	895	896	913	986	...	791	795	862	899	...	26	22,656	+ 836
Nottingham Corporation	4,603	4,671	4,693	4,592	...	5,647	5,806	5,798	5,723	...	26	150,865	+ 36,927
Oldham Corporation	3.049	2,908	2,770	2,948	...	3,511	3,304	3,608	3,379	...	27	95,143	+ 17.308
Reading Corporation	1,163	1,153	1,112	1,133	...	1,432	1,426	1,412	1,415	...	25‡	34,747	—
Rhondda Tramways	1,614	1,668	1,664	1,625	...	2,025	1,981	2,025	2,077	...	39	68,331	+ 10,590
Rotherham Corporation	1,858	1,870	1,895	1,906	...	2,578	2,561	2,674	2,613	...	25‡	62,114	+ 14,424
Sheffield Corporation	12.573	12,586	12,236	12,672	...	13,228	13,044	14,057	13,798	...	26‡	363,031	+ 41,672
Southampton Corporation	2.341	2.310	2,165	2,243	...	2,787	2,752	2.708	2,646	...	25‡	66,980	+ 14,763
Southend-on-Sea Corporation ...	1,186	999	916	809	...	2,304	2,000	1,767	1,463	...	26	38,351	+ 10,809
South Shields	1,017	984	1,005	923	...	1,200	1,167	1,184	1,194	...	26	30,774	+ 5.820
Sunderland Corporation	1,969	1,912	1,859	1,851	...	2,119	2,034	2,098	2,052	...	26	55,187	+ 7,248
Swindon Corporation	302	293	288	285	...	329	333	310	309	...	25†	7,957	+ 876
Torquay Tramways	1,065	1,091	898	897	...	1,408	1,284	1,171	1,047	...	39	36,607	+ 10,940
Tyneside Tramways and Tramroad	...	...	...	...	...	...	...	...	...	...	—	—	—
Wallasey Corporation	1.897	1,612	1.608	1,563	...	2,040	1,923	1,780	1,799	...	25†	51,558	+ 8,210
Walsall Corporation	...	...	1 062	999	...	...	...	1,165	1.284	...	26	32,205	+ 6.808
Walthamstow U.D. Council ...	1367	1,311	1,327	1,216	...	1,562	1,413	1,504	1,475	...	26	38,960	+ 5,376
Warrington Corporation	577	570	584	590	...	792	798	784	809	...	26	19,326	+ 5,495
West Ham Corporation	3.924	3,772	3,913	3,744	...	4,815	4,715	4.719	4,984	...	25‡	116,793	+ 20.078
Wigan Corporation	2.036	2 068	2 048	2 003	...	2,427	2.567	2,462	2,636	...	26	60.812	+ 10.139

*** A number of undertakings have suspended the issue of traffic returns for the duration of the war.

Colonial and Foreign Tramway Traffic Returns.

NAME OF COMPANY.	1917. WEEKS ENDED.					1918. WEEKS ENDED.					AGGREGATE.		
	Sept. 8.	Sept. 15.	Sept. 22.	Sept. 29.		Sept. 7.	Sept. 14.	Sept. 21.	Sept. 28.		Wks.	1918.	Increase or Decrease.
	£	£	£	£	£	£	£	£	£	£		£	£
Anglo-Argentine	53,759	53,807	53,200	53,126	...	60,531	53,760	60,741	57,622	...	39	2,170,543	+167,883
Calcutta ... ... Rs.	71.298	72.544	71.436	72,239	...	83.105	68,601	74,277	79,928	...	49	2,877,750	+243,244
Madras ... ... Rs.	(2 weeks)	36.217	(2 weeks)	34,219	...	(2 weeks)	35,470	(2 weeks)	36,588	...	38	717.964	+ 93,552
Pernambuco	3,804	3,787	3,845	4.060	...	4,546	4.294	4.322	4,261	...	39	172,571	+ 26,499

Companies issuing Monthly Statements only.

	1917.						1918.						Wks.	AGGREGATE.	
	April.	May.	June.	July.	Aug.	Sept.	April.	May.	June.	July.	Aug.	Sept.		1918.	+ or —.
	£	£	£	£	£	£	£	£	£	£	£	£		£	£
Ballarat & Bendigo	4,538	2,877	2,811	2,563	...	...	4,094	3.287	3.075	2,948	...	...	16	13,404	+ 615
Brazilian Trac. Mlrs.	7453000	7864000	7642000	7.795000	8064000	...	8330000	9030000	9087000	9465000	9491000	...	34	68,649,000	+8,144,000
Brisbane	31.620	33,340	32,475	32,720	36,925	31,600	35,530	37,610	36.245	36,360	42,670	35.400	39	325,854	+ 31,014
British Columbia $	447,429	438,919	373,029	438,378	454,425	...	515.417	486,876	488.873	413,968	544,339	...	8	958,307	+ 65,504
Buenos Ayres L'c'z.	39,111	40.595	38.020	38,063	39,111	33,655	41,643	41.315	38,375	41,145	41,817	41,006	13	123,969	+ 13,139
Burma	23,660	24,906	25,463	26.288	26.714	...	27.614	29.019	31.158	34.848	41,855	...	4	41,855	+ 15.141
Cape Town	16,705	...	...	16,067	15 480	...	19,011	...	17.612	18,409	19.055	...	8	37,464	+ 5,917
Carthagena & H. ...	4.366	4,321	5,325	5,763	4,164	4,306	4.200	5,027	5.047	5.491	2,729	2.549	39	38,401	— 4
Cordoba	13.660	13,735	...	...	...	...	14,799	15,649	...	...	...	...	8	30,448	+ 3,053
East India	1.445	1.455	1,186	1,183	1,562	1,512	1.791	1,920	1.754	1,968	1,975	1.939	8	3,914	+ 840
Kalgoorlie	2,705	2,692	...	...	...	...	2.876	2,767	...	...	...	...	21	13,238	+ 445
La Plata	4.230	4.127	3,852	3.876	4,075	3,450	5,169	5,105	5.134	6,722	4.382	4.999	39	46,315	+ 9,769
Lima	37,834	35.336	28,557	37,731	...	...	43.557	42.881	42.129	45,974	...	...	30	302,096	+ 53,963
Manaos ... Rs.	...	158.613	...	...	...	...	...	153,132	...	...	...	...	21	741,459	— 16,679
Manila ... $	65.600	61,500	...	...	...	...	84,000	93,500	...	...	...	...	21	367,500	+ 100.060
Monte Video ...	29.230	28.716	27,458	28,597	28,860	29,426	33.704	32.301	30,503	31,684	16.937	29,611	47	347,073	+ 17.394
Peruvian ... $	957.500	902.780	965,420	975.000	979.430	950,740	1079880	1022120	1099470	987,300	1029610	957,910	13	2,974,820	+ 69,650
Port Elizabeth ...	3.904	3,494	...	3.544	3.360	...	4,028	...	5,404	3,395	3,725	...	8	7,120	+ 216
Rangoon	5.036	4,737	4,383	4.783	4.788	...	5.885	5,719	6.163	6.055	5,760	...	34	46,560	+ 7,368
Toronto ... $	970,367	992.460	984.529	954,192	1039819	...	1065766	1090747	1035932	1049936	1070567	...	34	8.476,672	+ 609,077
Winnipeg ... $	265,594	259,794	254,226	242,797	248,457	...	296,433	280,935	293,140	288,155	288,974	...	34	2.388,467	+ 223,843

Digitized by Google

All Commercial Motor Vehicles

need daily attention to maintain efficiency—the simpler therefore the mechanism the easier and quicker becomes the daily preparation.

The Daimler Engine is remarkable in its time and labour-saving qualities. With no springs to create trouble, no valves that need grinding, and no loss of compression, oiling is practically the only daily operation. It occupies a matter of minutes and the vehicle is then always good for a full day's service without fear of mechanical troubles. Day-in day-out, year-in year-out, it gives of its best. That best is the high standard of efficiency and good service the Daimler Commercial Vehicle initiated.

MANCHESTER'S Record of DAIMLER Performance.

Year Ending March 31st.	Mileage Run.	Per 'Bus Mile. Average Cost.	Average Revenue.	Repairs and Maintenance.
1915	160,775	7·36d.	9·24d.	—
1916	82,711	7·17d.	11·84d.	1·68d.
1917	180,956	8·04d.	9·67d.	1·20d.
1918	216,818	9·56d.	13·42d.	1·78d.

SHEFFIELD'S Record of DAIMLER Performance.

Year Ending March 25th.	Mileage Run.	Per 'Bus Mile. Average Cost.	Average Income.	Repairs and Maintenance.
1914	214,775	6·67d.	10·20d.	1·22d.
1915	369,404	7·03d.	10·47d.	1·91d.
1916	540,628	8·48d.	12·06d.	2·87d.
1917	620,196	9·84d.	13·31d.	3·27d.
1918	629,399	14·02d.	17·91d.	4·41d.

Records of Service in Municipal Areas that tell their own story.

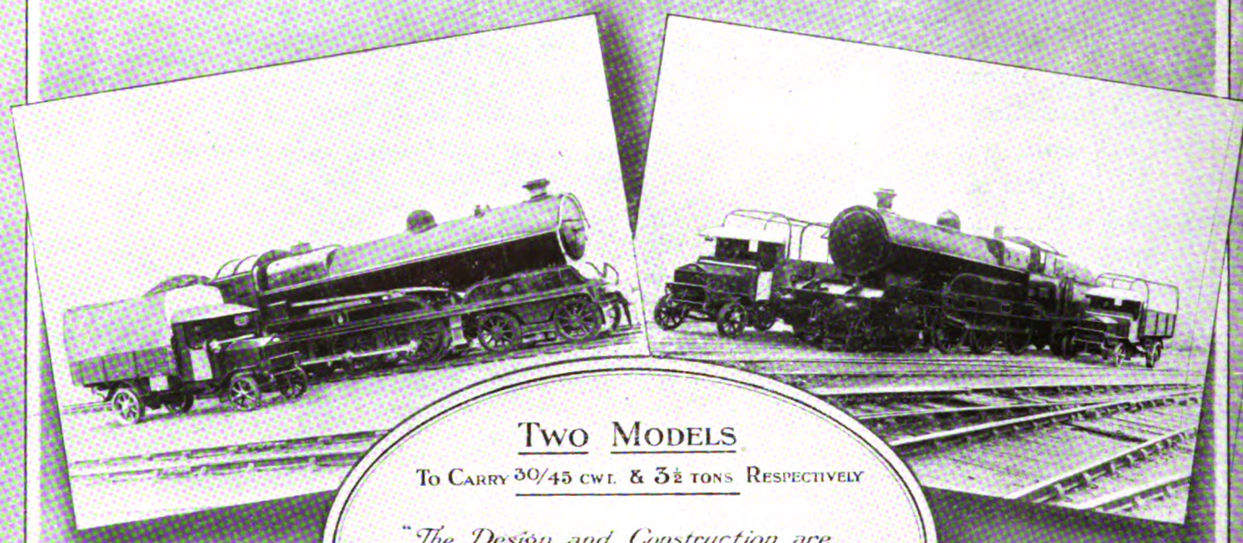
The DAIMLER Company, Ltd.,

Coventry.

Digitized by Google

NAPIER

MOTOR VEHICLES.



TWO MODELS

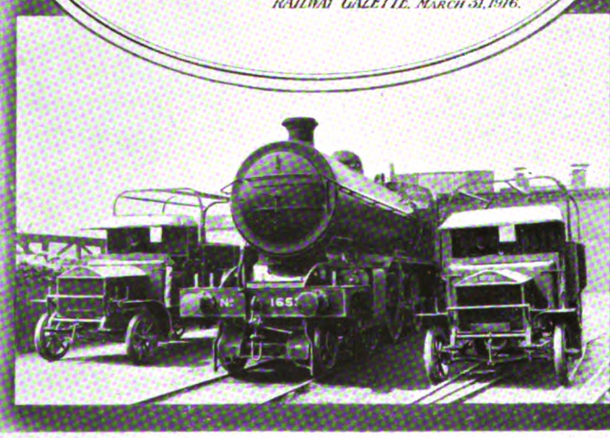
TO CARRY 30/45 CWT. & 3½ TONS RESPECTIVELY

"The Design and Construction are Throughout of a Character, which it would be Exceedingly Difficult, if not Impossible, to Improve Upon."

RAILWAY GAZETTE, MARCH 31, 1916.

IN PEACE

USED BY THE LARGEST CARRYING COMPANIES AND COMMERCIAL HOUSES.



IN WAR

USED BY THE BRITISH AND ALLIED GOVERNMENTS.

D·NAPIER & SON LTD.

WORKS
ACTON, LONDON. W

14, NEW BURLINGTON ST. LONDON. W.

Digitized by Google

TRAILERS FOR MOTOR VEHICLES.

In these notes last month reference was made to some of the regulations which govern the use and incidentally tend to restrict the design and development of heavy motor vehicles. Perhaps the direction in which the existing laws stand in the greatest need of amendment is where they touch upon the employment of trailers. Amendment is here required from two points of view. The first and most obvious is that the existing regulation under which no heavy motor car may draw a trailer at a greater speed than five miles an hour should certainly be altered to allow of higher speeds when power vehicles and trailers are rubber-tired. So long as there is no difference between the legal speed limits for rubber and iron tires, no encouragement is offered to the use of the former. It would certainly be better for the roads if tractors and trailers were fitted with resilient tires; for a combination so fitted would undoubtedly do less injury to road surfaces and foundations with a speed limit of eight miles an hour than would a steel-tired tractor and trailer with a speed limit of five miles an hour. Presumably the existing speed limit is imposed principally in the interests of the roads, and if this is so there is a clear case for an alteration. Of course, if it is regarded as inherently unsafe to allow any vehicle to draw a trailer at anything above five miles an hour the position is changed, but we hardly think that this could be seriously argued in view of the somewhat extensive use of trailers behind heavy lorries both by our Allies and by our enemies for purposes connected with military transport.

THE TRACTOR AND TWO-WHEELED TRAILER.

The second reason why a change is needed in the law regarding trailers is that, as it stands at present, there is no clear definition as to what a trailer really is. In certain instances there is no room for doubt. The ordinary four-wheeled trailer attached to the power vehicle by a drawbar is an obvious case, but this is by no means the only conceivable type. Extensive use is made in America of a device known there as a semi-trailer. This consists of a two-wheeled vehicle carrying a body and attached to the power vehicle through the medium of a turntable and suitable joints over the rear axle of the latter. The result is a six-wheeled combination such that the bulk of the useful load is so placed as to assist the adhesion of the driving wheels. The length of the whole combination is considerably less than that of a tractor and trailer. Any danger that the ordinary type may suffer when negotiating steep down grades is decreased, if not entirely removed. There is not the same tendency for the load to push the power vehicle round in the road and so to cause an accident. In certain ways a combination of this kind has a distinct advantage over an ordinary four-wheeled lorry. The load-carrying body, with the pair of back wheels, can be detached from the power unit, its forward end being then supported on legs. Loading and unloading can proceed while the power unit is out on the road doing useful work. It would be reasonable to regard a combination of this kind simply as a six-wheeled motor vehicle, but at present the regulations are obscure upon the point and it might quite possibly be classified as a tractor and trailer.

THE AUTO TRAILER.

Yet another type of attachment is exemplified by the device known as the auto-trailer. This consists of a small carrying platform supported on a single wheel, which works on the castor principle. The platform is attached to the power vehicle at both ends of the rear of the frame so that independent lateral movement is impossible. Consequently a vehicle with an attachment of this sort is quite easy to back and to manœuvre. Here again we have a case in which the attachment might or might not be regarded legally as a trailer. It is certainly hauled behind a power vehicle and the greater part of its load is carried upon its own wheel, and therefore does not help the adhesion of the driving wheels. When rounding a corner it behaves in the same way as an extension of the overhang of the main vehicle. On the other hand, it does not complicate steering and cannot possibly tend to push the power vehicle round in the road. It is completely under control and consequently may reasonably be regarded as an extension of the power vehicle itself, in which case its presence would not entail any special reduction of legal speed.

THE ROAD TRAIN.

Another doubtful case is that of the road train, in which the following vehicles are not merely trailed, but do their share in the propulsion of the whole train, the load upon them assisting to secure adhesion. This result can either be achieved by mechanical or electrical transmission of power, the latter being perhaps the simpler method. Moreover, the following vehicles of a road train can be so coupled up as to be exactly steered in the track of the leading vehicle. Altogether the method does not introduce most of the disadvantages of the ordinary trailer; consequently it would be

Digitized by Google

MOTOR TRAFFIC.

reasonable to provide for the use of a road train with more than one following vehicle without reducing the legal speed to that of a road locomotive with trailers. The load is well distributed and all the units of the train are well controlled, and so it is possible to back with great accuracy. A road train consisting merely of a leader and one following vehicle might be allowed a speed limit only a little lower than that of an independent vehicle, but the limit should be progressively reduced as the number of the following vehicles is increased.

COMPREHENSIVE TRAILER REGULATION NEEDED.

All the special devices briefly described in the preceding notes are at present in a very vague and unsatisfactory position from the legal standpoint, and we hope that as a preliminary to the work of reconstruction and of securing increased economy of transport, such cases will be taken in hand and comprehensive and satisfactory regulations framed to cover them all and to permit development to proceed unimpeded by doubtful decisions based upon the confused state of the law.

RESEARCH WORK IN THE MOTOR INDUSTRY.

We are all in agreement as to the desirability of a comprehensive system of research into many matters relating to the design of motor vehicles. Consequently, it is satisfactory to note from the report of the Research Department that the motor industry is one of those that is active in the formation of a Research Association. The Government scheme, as our readers will remember, provides that such associations may be financed partly by the industries concerned and partly by the Research Department of the Government. In such circumstances the Research Department must necessarily exert some kind of supervisory control. Nevertheless, one can see distinctly the danger of an industry allowing the Department to have the chief voice in deciding what shall be done with the results of research. If this power were indiscreetly exercised the firms subscribing to the Research Association would obtain no more benefit than those who refrained from doing so, and a most unsatisfactory position would be set up. In this matter we think the Research Department should be satisfied with the power of determining in what cases results must not be published on grounds of national interest. They should certainly not be enabled to hand any such results over to firms that have not subscribed to the associations which obtained them. Another interesting point arises as regards the internal government of such as association. The research is to be carried on for industrial purposes and, therefore, too free a hand should not be given to the investigators employed to conduct those researches, but a general supervision should be exercised by the practical but nevertheless scientific element contained in the industry itself. The details of research work must, of course, be controlled by a single brain, but it would not be safe to allow any one man to have complete authority to decide upon the broad lines of the work and the objects towards which it should be directed. The exact allocation of responsibility is somewhat difficult to arrange, but it is clear that we must not on the one hand give too much control to purely financial interests, or on the other allow a scientist with insufficient practical knowledge to waste money upon investigations more likely to be interesting to him than productive to the industry for which he works.

ENGINEERING TRADES COMMITTEE.

We understand that good progress has been made, so far as the motor trade is concerned, by the Engineering Trades (New Industries) Committee. Large numbers of firms have successfully applied for facilities for manufacturing experimental vehicles of post-war type, and the necessary materials are now being made available to them. Such vehicles, when constructed, will of course require to be subjected to road tests before being standardised, and this will involve the consumption of a certain amount of petrol. We gather that the Engineering Trades Committee, and the appropriate Branch Committee, are also taking this matter up, and it is hoped that fair allowances of fuel will be granted for this specific purpose. All this is most important for the future of the industry, because it is obviously impossible to complete plans for quantity production early enough to secure continuity in the employment of labour when Government contracts cease unless all the preliminary constructional and testing work can be completed well in advance.

THE LUXURY TAX.

While the luxury tax will not in any case apply to commercial and public service vehicles, yet if it becomes law it may well affect any of our readers considerably in their capacity as motor car owners. The principle of taxing a modern alternative, which is offered in place of an old method, does not appear to be a sound one, especially when the new form of locomotion depends upon vehicles somewhat expensive in the first instance but showing their superiority rather as time-savers and as a result of low operating costs. The fallacy about the luxury tax may perhaps be best illustrated somewhat as follows :—One man sticks to his old car, on which he paid no tax, and in the course of the year spends £200 on operating costs. Of this amount perhaps £100 is represented by fuel which the old vehicle uses somewhat extravagantly. Another man buys a new car on which he has to pay £100 luxury tax. He covers the same annual mileage with a total expenditure of another £100, and uses only half as much fuel as the first man. He carries out his business more efficiently because he has a more reliable vehicle. He calls for the occupation of less tonnage in importing his fuel. Ought he not to be encouraged rather than discouraged? Under the proposed tax, the man who stuck to the obsolete vehicle would apparently be regarded as a more praiseworthy and patriotic member of the community than his friend. As a matter of fact, it is the man who encourages progress who deserves encouragement. The tax, if ever applied, will probably prove to be open to numerous forms of evasion and to be extremely expensive of collection. Altogether it is doubtful whether the Government will not find that in this and other items there are so many openings for failure as to make it politic to drop the whole scheme.

THE WOLSELEY SCHOLARSHIP.—This scholarship, which is one of those given annually by the Wolseley Motors, Limited, to students in the faculty of engineering at Bristol University, has been awarded to Mr. C. W. Lalonde, who has secured the B.Sc. (engineering) degree. The scholarship is of the value of £100 per annum, and is tenable for two years in the Wolseley works. Mr. Lalonde is the son of Mr. W. L. Lalonde, one of the principals of the firm of Messrs. Lalonde Brothers and Parham, of Weston-super-Mare and Bristol.

Digitized by Google

MOTOR TRAFFIC.

SOME PROBABLE EFFECTS OF THE WAR ON THE AUTOMOBILE INDUSTRY.*

In his presidential address at the first meeting on October 2 of the 1918–19 session of the Institution of Automobile Engineers, held at the Royal Society of Arts, Mr. A. A. Remington dealt with "Some of the Probable Effects of the War on the Automobile Industry." He referred more particularly, although not exclusively, to those aspects of the subject that affect the Institution, and to which, as most of his auditors were aware, he devoted most of his public activities, namely, standardisation and research.

It was early found that once the Armies were supplied, the automobile industry could with accelerated production, quite within its capacity, turn out more vehicles than were required, and fortunately many firms were able to turn to the manufacture of machinery that was within their capacity and badly wanted for the use of the Armies, namely, aircraft engines and aircraft. With the development of the use of aircraft in war, it was soon clear that the facilities for manufacture would have to be materially increased, and many firms that normally produced nothing but automobiles had the honour of teaching the special points of their business to engineering firms that had hitherto been manufacturing in other more or less similar directions, so that they might devote all their own energies to the aircraft industry, or other work that was within their capacity, and badly wanted for the prosecution of the war. It was exceedingly fortunate that the automobile industry in this country had developed, to a high degree of proficiency, methods that were essential to the rapid production of the more complicated munitions. I refer to the accurate production of complicated machinery out of high grade materials on a manufacturing scale, so that large quantities of such parts could be produced on an interchangeable basis rapidly and economically.

The introduction of similar methods into kindred industries where they were not generally employed previously has been accelerated by the war, and will undoubtedly have a great effect on production after the war. The dissemination of information as to essential methods in regard to the interchangeable and accurate manufacture of machine parts in large quantities that had been accumulated will not handicap the automobile industry by having caused it to lose its so-called secrets, but will benefit that industry by increasing the general prosperity of the country and by enabling it to enlarge its markets. It will also directly benefit the engineering industries by enhancing the possibility of an increase in output without any essential increase in the man-power. This matter can be considerd from another point of view. Those firms who have had to take up manufactures that were foreign to them to the exclusion of their normal productions, will find that they have had a most valuable experience, one that will be reflected in their post-war products, greatly to the benefit of themselves and their supporters. On the other hand, those firms who are perhaps looked on as fortunate in that they are still able to continue with the manufacture of their normal product in much the pre-war way, will, after the war, if they do not exercise the greatest care, be at a considerable disadvantage.

Other directly beneficial effects will be produced throughout our industry by the co-operation and interchange of ideas that this change in and interchange of products has necessitated, which has brought our engineers into close touch with each other with a common object in view. Interchange of ideas is always beneficial, so while individual firms may feel they have lost by so much dissemination of information, they will find that on the whole no one has lost, but all have gained.

The author of the paper does not take the pessimistic view that the tremendous war expenditure will restrict the after-war trade to cheap lorries and cars. During the war trade in general has been greatly restricted, and in many cases has practically come to a standstill, while in the war area there has been great destruction, as compared to normal times when the world produced a little more than was required to maintain its standard of living. During the war we have been to a large extent living on this accumulated margin, and after the war shall be compelled to make up the shortage. To enable wealth to be again accumulated it will be necessary to devise and utilise every possible means whereby everyone can produce more for the same labour. One of the factors that enables this to be done is rapid, economical, and convenient transport, and I am at a loss to find anything that provides this better than the various classes of automobiles.

We shall doubtless suffer from severe taxation and high cost of living, but as the automobile is a time-saver, the adverse conditions of life will accentuate rather than diminish the necessity for it, and it will be more than ever a necessity and money-maker. The transport of men and munitions of all kinds by motor lorry and the use of motor cars of open types has been a tremendous object lesson as to the utility of motor transport. Men who will ultimately return to civil life have had this lesson before them, and when conditions render it possible we shall see, as the result of this education, a great extension of the use of motor transport. Fortunately this country will not be alone in high costs, as the high costs here and in other belligerent countries will mean high costs throughout the world, which will in a very great measure tend to balance matters and largely prevent British industries being at a disadvantage in comparison with foreign competition. Doubtless the temporary high cost of labour and materials and the, in all probability, permanent reduction in the value of money will make the price of post-war vehicles appear high judged on a pre-war standard, but value can only be considered in relation to the cost of other commodities, and if the increased knowledge of manufacturing and the higher possible efficiency of cars consequent on increased knowledge obtained during the war be taken full advantage of, post-war cars ought to compare very favourably with other products on a basis of comparative cost.

After the war the personnel of all branches of the automobile industry will have to make great efforts to put the industry on a proper basis once more, and the result of these efforts on the part of the technical staffs of the various factories will be to effect great improvements in the motor vehicle in many directions. Representatives of all branches of industry, commercial as well as technical, will have learned many lessons under that stern master, war, and these lessons are going to be used to advantage in industry.

It yet remains to be seen to what extent it will be policy for the automobile engineer to take advantage of his aeronautical engine experience. The aeronautical engine has a much higher mean effective pressure, higher mechanical efficiency, and lower specific fuel consumption than even the most advanced pre-war automobile engine, but the requisite characteristics for the two classes of work are so different that while aeronautical engine experience can with advantage be used to some considerable degree in the automobile engine, it is difficult to say just how far results will warrant this utilisation.

Great changes will in all probability be noticeable in the organisation of our factories, and some of these changes will have far-reaching effects. Owing to experiences in the management of factories during the war the technical officials of our engineering industries will be more appreciated than was frequently the case before the war, and will continue to exercise greater powers and carry greater responsibilities than formerly. In the past the technical man in the engineering industry has always been subordinate to the equivalent commercial man. The requirements of the higher positions on the scientific side of industry will necessitate the employment of many more highly-trained scientists, and it is to be hoped that ultimately all management positions in engineering industries will be filled by men possessing scientific knowledge as well as business experience. This change which is rapidly taking place cannot help but have a far-reaching effect on the automobile industry, as well as on the economics of the country in general. The automobile industry has shared in no small way in helping to provide the conditions that are bringing about this change of view point, and now the art of flying is carrying on the same good work.

In the early days of the industry every automobile works was in effect a research laboratory, or an experimental shop on a commercial scale, but as design and practice became more stabilised and manufacture came to be carried out on a larger scale, this naturally came to be less and less the case. In stabilising design, research is still as necessary as formerly, perhaps more necessary as improvements become less obvious, but it has to be carried out in a different manner. Most large firms now have a research laboratory, but it is impossible for the smaller firms to go to this expense, and this is where it is the duty and privilege of the larger firms to help them. In connection with unpatentable improvements it is impossible and, in my opinion, undesirable for the general good, and ultimately for the individual good, that a firm should be able to confine the use of such improvements exclusively to its own products.

The research laboratories of most large firms—all those that I have had any relations with—are usually more than fully occupied in investigations directly connected with the firm's products, and have little or no time to give to pure research, or to any researches that are not rendered immediately necessary, or to carry even such researches any deeper than is absolutely necessary, so that the establishment of means for co-operative research would not in any way reduce the amount of work done in firms' existing laboratories, but would be additional thereto. I need not refer to the Government scheme for the establishment of State-aided Research Associations under the ægis of the Department of Scientific and Industrial

* From a Paper by Mr. A. A. Remington, President of the Institution of Automobile Engineers.

Digitized by Google

MOTOR TRAFFIC.

Research, except to emphasise that in the event of the automobile industry establishing a research association of its own, it will not cause any reduction in the amount of research work to be done in the private research laboratories of the various firms but will enable researches of a more far-reaching character than can be attempted individually to be carried out on a co-operative basis.

As regards the classes of research it is desirable should be carried out co-operatively, I would cite the research in connection with standard automobile steels that is now in progress, and also call attention to the great advantage that would accrue to the industry as a whole from researches such as the following :—

(1) An investigation to establish the most economical application of the laws relating to conductivity, heat transference and diffusivity, as affecting motor car radiators, so as to enable the smallest or lightest radiator for a given case to be determined, including the most suitable proportions for the provision of air draught, the most suitable rate of air draught, and rate of flow of the water.

It does not take much consideration to see that for the most efficient cooling of the circulating water the radiator should be maintained at the highest possible temperature equally all over; how to attain this ideal is not so obvious. It cannot be completely attained in practice, but present practice does not approach anything like as near to the ideal as it might do.

(2) An investigation to determine the factors making for comfort in suspension, including the inter-relationship between such factors as :—

(a) Vertical periodicity of the front and rear springs respectively in relation to each other.

(b) Rolling periodicity.

(c) Pitching periodicity.

(d) Metacentric height (to adopt a term well known in naval architecture).

(e) Wheelbase.

(f) Weight distribution.

Referring at considerable length to standardisation, the author called attention to the work accomplished by the British Engineering Standards Association for the automobile industry, with the co-operation of this institution. Through its sectional committee on Automobile Parts, the British Engineering Standards Association has so far published 19 reports useful to the automobile industry.

The war had been the means of causing almost every British pre-war motor car factory to be greatly enlarged, and it is therefore to be expected that after the war the output will be greatly increased, and this will mean that greater standardisation will not only be possible, but profitable. It is therefore highly desirable that we should all, in our mutual interests, do everything we can to forward the work of standardisation for the automobile industry.

It is unnecessary to say much about invention. The institution does not, however, forget the inventor and his interests, and is at this moment negotiating with other institutions with a view to promoting Government action to remove the hardship that has been inflicted upon many inventors, owing to their inability to work their patents during and on account of the war. The automobile industry has been largely dependent on inventions for improvement, whereas now, although the inventor pure and simple is still highly important, he shares the responsibility for improvements with the more systematic research and production engineers.

Closely associated with invention is design, and it is now appropriate to consider some probable effects of the war on the design and probable performance of the post-war motor car.

The war, particularly in its earlier phases, gave great impetus to individual metallurgical research owing to the necessity for greatly increased output of machinery of the highest class from the plants of the country, and also owing to the necessity for the whole of the output to meet stringent Government requirements, whereas previously only a select portion had been required to such high standards. (Whether these high standards which most of our Government departments demanded were really necessary is not within my province to discuss to-night.) One of the immediate results of this work will be to give automobile engineers after the war an adequate supply of materials superior to what they had available before, and also superior means of ascertaining the quality. A reaction on the part of engineers as a result of this can already be seen in so far that at any rate the more advanced technical members of the industry are looking for means of turning the possibility of better materials to advantage in still further increased reliability, in weight reduction, in cost reduction, and in many other directions.

One effect of the war will be to increase materially the interest of engineers in matters affecting pure design, just as it has increased the interest of the steel maker in metallurgy. By taking advantage of the increased knowledge particularly of materials, of distribution of stresses in engine parts, and of flow of gases, gained from research primarily on behalf of aeronautical engine development, there is no doubt that the post-war automobile engine will embody great improvements, perhaps more particularly as regards power-weight ratio, economy, and improved power performance at lower cost without serious corresponding disadvantages.

Concluding a lengthy reference to design, Mr. Remington said it is to be regretted that there has in all probability been less thought given to automobile design during the war than in previous years, particularly as regards the inventive side and in connection with the development of accessory improvements, and we must therefore not look for too much advance in such directions. In all probability the post-war car will carry forward with a considerable step the same developments that were continuously in evidence during the ten years, 1904 to 1914, in which period we can trace certain more or less well-defined continuous, even if comparatively slow, developments. In engines the trend has been continuously towards obtaining more power from less weight of metal, and in cars towards reduction of tare weight for a given load, the main underlying objects being presumably improvement of performance coupled with a reduction in cost for a given performance.

To enable the scientific development consequent on the war to be taken full advantage of will require some re-organisation of departments as compared to the usual pre-war British method. It was becoming usual before the war for the organisation of the British automobile factory to include a " chief engineer " in charge of the technical and scientific organisation as distinct from the production departments. The laboratories that will in the future form an essential part of all up-to-date factories will be subordinate to the chief engineer, and the chiefs of such laboratories will be responsible solely to that official.

Usually it will be found advisable to arrange for the test house, in which the physical tests for the passing of production material will be made, to be under the control of the inspection department, and also to deal similarly with routine analysis, so as to avoid the upset and delay of research work that inevitably results from introducing " output " work into research departments.

It is too much to expect that one man can be at the same time a fully qualified metallurgist, chemist, physicist, and experimental engineer, and therefore the research work must be sub-divided among several " scientists," each, under the general control of the chief engineer, taking care of his own branch of the work, and co-operating closely with the others. The terms metallurgist, chemist, and experimental engineer are now comparatively well-known in connection with the organisation of an engineering works, but outside of educational establishments the term " physicist " is perhaps not in common use. The studying of, and necessity for, the more general use of methods of investigation of causes of fatigue, of distortion of structures under stress, of stress distribution, of factors of safety, of strength of materials under special conditions, and such like matters, has introduced work outside the ordinary scope of either the chemist, the metallurgist, or the experimental engineer. This comprises in the main a form of analytical engineering, and in all probability the gap can only be filled by introducing into the works organisation a further position requiring a distinct title, which I have for convenience called the " physicist."

In conclusion, the author congratulated the institution on the great work it initiated—work which will in the future benefit almost every branch of engineering in this country—and carried out by co-operation with the British Engineering Standards Association, the standardisation of steels for the automobile industry. This work is now approaching completion, and the author has hopes that it will be completed and published during his term of office. He added that the question of strength of materials and standardisation thereof, together with standardisation of methods of testing, is by no means exhausted. He is of opinion that the institution could usefully co-operate in the formation of a society that would further the interests of testing and specifications for testing and the supply of materials somewhat on the lines of the Society for Testing Materials in America.

GLASGOW CORPORATION GARAGE.—The special committee of the Glasgow Corporation motor car garage have had under consideration the question of the charges to be made for the use of the cars belonging to the department, in view of the further advances in the costs of maintaining the garage. After discussion, and having heard the tramways manager on the subject, it was agreed that the charges be increased. The War Wages Committee recommend that an additional war bonus of 3s. per week be granted to the chauffeurs in the garage, thus raising their remuneration to 25s. per week over pre-war rates (present wages 38s., bonus 20s. per week). The tramways manager has been instructed to have the city arms painted prominently on the motor cars belonging to the department.

Digitized by Google

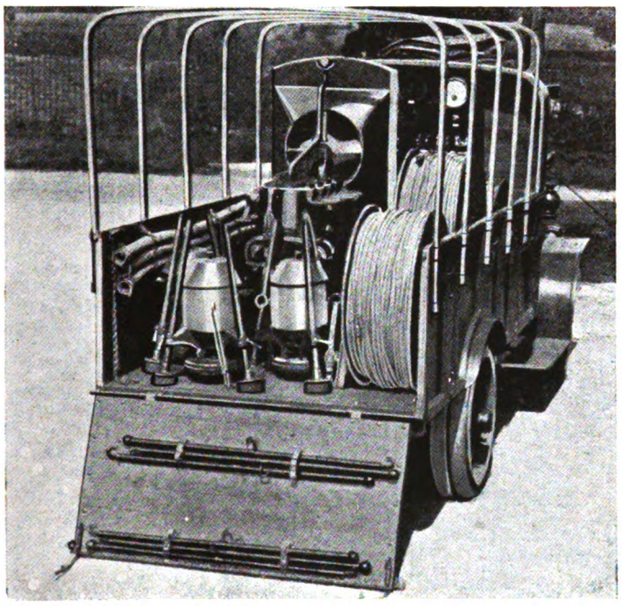
MOTOR TRAFFIC.

FOR TRENCH PUMPING.

Motor appliances are now used by the British Army to pump out trenches on the Western front. This is a new use for the motor vehicle and it suggests similar work in commercial service in pumping out ditches and excavations where other forms of power are not readily available.

In the early fighting at Ypres, where the Canadians stood waist high in water in the trenches, the hand scoop and pail were the methods of getting rid of the water. Then came hydraulic pumps, but these were not entirely satisfactory, because of the slow rate of pumping. The motor outfit, says the *Commercial Vehicle* of New York, is capable of pumping out 3,000 gallons an hour.

The equipment comprises an Austin 2-ton truck with a separate 4⅛ by 6 four-cylinder motor of 32 rated horse-power, mounted in the body and directly connected to a compound-wound direct-current dynamo; three portable combination 200-volt electric-motor and centrifugal pumps, and reels of cables by which the



Trench Pump Outfit on an Austin Wagon. It Comprises a Motor Generator, Three Portable Pumps, and Three Reels of Cable.

pumps may be set down in the trenches while the truck is some distance back of the lines. The pumps are especially designed to handle muddy water without clogging.

The wagon serves as a means of making the outfit mobile. The truck and outfit can be used with greater success at night, because it will draw less of the enemy's fire, although it can be used in daylight when camouflaged. The compact manner in which the outfit is carried in the wagon is shown in the accompanying illustration. These appliances are being supplied in considerable numbers.

FATALITY DUE TO LATENT FLAW IN STEERING ROD.—At an inquest held by the City of London Coroner on September 26, on the body of a newspaper carman, whose death was caused by a collision between his cart and a motor omnibus, due to a defect in the steering gear of the omnibus, Mr. George Shave, engineer to the London General Omnibus Company, said that the steering rod snapped off because of a latent flaw recently developed. Every year every omnibus was stripped and re-assembled. The steering gears were sent for special examination, and the date of the examination was stamped on the metal. In the present case the annual examination was due in a few weeks. Steering gears were also examined every 14 days, but it was impossible to detect such a flaw as the present one, even by expert test. The jury returned a verdict of accidental death.

ELECTRIC VANS FOR DUST COLLECTION.

Having had exhaustive reports on dust collection by electric vehicles prepared by Dr. Buchan, the medical officer of health, Willesden Urban District Council have now decided to make application for the necessary priority certificate for the purchase of three 2-ton electric wagons.

The report declared the essential conditions in the selection of a vehicle for the purpose of house refuse collection to be as follow:

(1) The capacity must be at least 7½ cubic yards, equivalent to 2½ tons by weight of house refuse.

(2) The body must be low slung for easy loading. (It is suggested that there might be folding sides to the body in order to get the greater part of the loading done without a ladder.)

(3) The body should be of galvanised steel with a wooden strip at the top to save damage to the vehicle and bins. The wooden strip would be renewed when worn out.

(4) Covers of wood or metal should be provided.

(5) The chassis should be adapted to take a trailer.

(6) Both wagons and trailer should be mechanically tipped.

(7) The motive power should be sufficient for a range of 45-50 miles on one charge.

(8) The vehicles should be able to turn in a small circle.

One trailer should also be obtained to be used in the event of bad weather, a breakdown, or other contingency preventing regular collection.

As to vehicles, men, and work to be done, the report stated:—

Vehicles to be obtained.—Three 2-ton electric wagons.

Area from which collection is to take place.—(1) The whole of the South Kilburn ward; (2) the whole of the Mid-Kilburn ward; and (3) the parts of Brondesbury Park and Kensal Rise wards south of London and North Western Railway.

Refuse to be collected.—The area contains 3,971 houses yielding approximately 4,000 tons of house refuse per annum, or on the average approximately 14¼ tons on each of the 279 working days in the year.

Men to be employed.—Three drivers and six dustmen.

Number of loads and amount of refuse collected.—The two vehicles working at the furthest points of the district from the shoot at Waxlow Road would each do two loads per day, and the third vehicle would do three loads per day. On this basis 14 tons would be collected per day, approximately the quantity required. There would still be some spare in these three vehicles, as with a little overtime each vehicle could do three journeys per day if necessity demanded it.

Garage.—The electrical engineer has estimated £50 per annum for garaging the vehicles at Salusbury Road.

The financial report is given as follows:—

The estimated capital cost is as follows:—

	£	s.	d.
Three vehicles (ten years' life)	4,000	0	0
Charging plant	150	0	0
Registration and number plates	6	0	0
	£4,156	0	0

On average daily running of 25 miles per vehicle, the annual costs are estimated as follow:—

	£	s.	d.
Wages of drivers and men at, say, 50s. per week each	1,170	0	0
(N.B.—It is a matter for decision whether these men should be paid, say, 3s. 6d. per ton moved plus, say, 50 per cent. of the tots, or whether they should receive a wage without tots or a wage with all the tots.)			
Repairs and maintenance of chassis, at 5d. per mile	43	11	10
Repairs and maintenance of batteries, at 4d. per mile	34	17	6
125 units of electricity per week, at 1½d. per unit	60	18	9
Insurance, £30	30	0	0
Tires: 6,975 miles per vehicle, at 1d. ...	87	3	9
Six licences	1	10	0
Rent of garage	50	0	0
Repayment of capital costs at 6 per cent. ...	564	0	0
Rent of shoots, at 2s. per load—2,000 loads	200	0	0
Sundries, at ·25d. per mile	21	16	0
Total	£2,263	17	10

Digitized by Google

MOTOR TRAFFIC.

ANNUAL REPORT OF THE ROAD BOARD.

On account of the war the work of the Road Board, of which Sir Geo. S. Gibb is chairman, was greatly curtailed so far as concerns the making of grants and loans during the year ended March 31, 1918. The reason is because the whole of the proceeds of the petrol duty, and the share of the proceeds of the carriage duties, which were formerly paid to the Board, were retained for war purposes by the Exchequer. The only receipts during 1917-18 were from interest and profit on investments and loans, the total being £173,002.

During the year applications were made to the Board for advances amounting to £860,288, of which £797,645 was for improvement of road crusts. The Board distributed a limited sum out of the Road Improvement Fund, mainly in the form of assistance for the tar treatment of roads. The total sum distributed for road crust work was £153,109, and £76,182 by way of loans. For other purposes the grants amounted to only £6,182. Since the establishment of the Board in 1910 the grants and loans to road authorities have totalled £4,458,489, of which £707,347 has been repaid. During the same period the receipts were £7,566,099, of which £703,682 was shown as interest on investments and loans. From the motor spirit duties the receipts were £4,075,608, and from the carriage licences, £2,786,809.

Control of Stone and Tar.

Attention is again drawn to the deterioration of the roads by reason of the shortage of labour and materials, and the increase of heavy motor traffic directly and indirectly connected with military movements. It became necessary to stimulate the production of road stone; to secure that such supplies of road material as were available should be used on roads of military importance and the more important roads of the country; and also to reduce as much as possible the transport of material by requiring that each locality should take its supplies from the nearest and most convenient quarries. Under a Defence of the Realm Regulation the Road Stone Control Committee, composed mainly of experienced road engineers, was appointed in August, 1917, and has done useful work. Later on it became necessary to limit and control the supplies of tar for road purposes, and during the year ending December 31, 1918, a bulk allocation of 52,000,000 gallons was made to the Board. This was subsequently reduced to 47,000,000 gallons, which had been allocated by the Board amongst highway authorities and others for use under permits on highways of national importance. About 500 applications each half-year for petrol licences from highway authorities, war officers and others connected with road construction had been referred to the Board by the Petrol Control Department and the Priority Department of the Ministry of Munitions.

Staff of 8,000 on Government Roads.

Special work undertaken for the Army Council, Admiralty, Munitions and Air Ministries, and Timber Supply Department has been continued, namely, the supervising and arranging for the construction and maintenance of new roads and improvement of roads for military purposes, and negotiating with highway authorities the amounts payable by the Army Council in respect of damage caused by extraordinary traffic. The total estimated cost of such work was £4,424,717, of which £2,228,300 was on public roads.

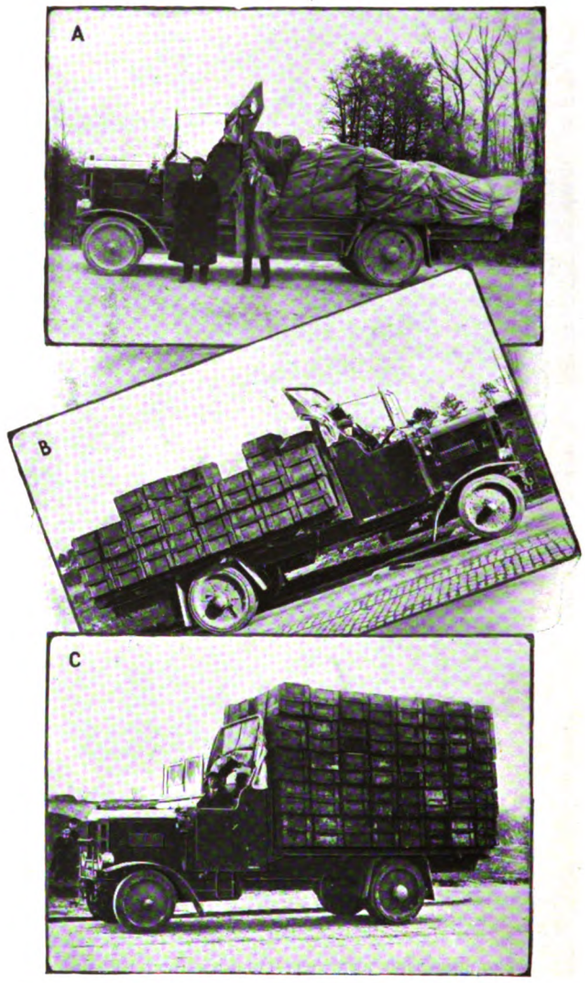
In connection with the special works undertaken for other Government departments mainly by direct labour, a temporary staff fluctuating in numbers between 7,000 and 8,000 was employed throughout the year under the direction of Mr. J. S. Killick, the county surveyor of Hertfordshire, previously the Board's assistant engineer, who is now acting manager and engineer in the absence in France of Brigadier-General H. P. Maybury, C.B. The thanks of the Board are extended to the County Councils of Durham and Essex for the continued loan of the services of Mr. A. E. Brookes, county surveyor of Durham, and Mr. A. J. Lyddon, assistant county surveyor of Essex, who have rendered valuable assistance as engineers-in-charge in connection with the special work.

Besides Sir G. Gibb, the members of the Board are Sir J. H. A. Macdonald, Lord Montagu, Lord Pirrie, and Viscount St. Davids. On May 12 last Lord Montagu retired by rotation, and was reappointed by the Treasury for a period of ten years.

Mr. R. McKean Cant, advertising manager of the B. F. Goodrich Company, of 117, Golden Lane, London, E.C., has accepted the post of assistant sub-director of education in Salonica. The work is carried on by the University Committee of the Y.M.C.A. at the invitation of the military authorities, to assist soldiers in carrying on their studies. Mr. Cant is a Fellow of the Institute of Commerce, and a holder of the diploma in literature of the Heriot-Watt College, Edinburgh. He has had practical experience of teaching during the past few years as lecturer on advertising and salesmanship, etc., for the London County Council.

IRISH USE OF A MAUDSLAY LORRY.

The accompanying illustrations of Maudslay lorries owned by the Station Cab Company, of Belfast, emphasise its usefulness at home under war conditions, and point to the ever-widening utility of such a vehicle and the influence it will wield in the post-war period on transport generally. Illustration A shows a Maudslay assisting in war work by carrying 5½ tons of flax seed from Wellington Bridge (15 miles south-west of Wexford) to Portadown. This seed was used to produce flax, which, after manufacture, is made up into aeroplane cloth for covering the wings of the machines which are doing such grand work on all battle fronts. The particulars



Maudslay Lorry's Work In and Around Belfast.

of the journey are interesting:—Left Belfast at noon on Wednesday, arrived back at Portadown on the Friday following, then delivered load at Rich Hill and returned to Belfast the same night. On a second run the trip was started on a Sunday morning, Wellington Bridge, a distance of about 225 miles, being reached the same night, after which the lorry returned to Belfast on Tuesday evening. Each of these trips totalled to a little over 450 miles, and in accordance with the Maudslay record each was completed without a hitch.

Illustration B shows a Maudslay lorry on its way to trawler station loaded with a hundred empty cases for fish. In the third illustration the same lorry is seen returning with a load of just over 6 tons of fish.

Another Electric for South Shields.—South Shields Council have two electric tipping wagons in use, and, subject to a satisfactory inspection and to the guarantees being satisfactory, the Council have asked Messrs. Orwell and Company, Ipswich, to supply a vehicle at an estimated cost of £1,045.

Digitized by Google

MOTOR TRAFFIC.

DUNLOP EDUCATION AND ENDOWMENT SCHEMES.

The conclusion of the first term of the Dunlop Rubber Company's educational scheme and the inauguration of a staff endowment scheme was celebrated on Friday, September 6, at the Birmingham Temperance Hall. Mr. J. V. Worthington, a director, presided, and was supported by the Lord Mayor of Birmingham and the principal members of the Dunlop staff.

Mr. S. C. Baisley, in explaining the schemes, said that the Dunlop education and endowment schemes were essentially encouragement schemes. They gave facilities for education and, as an inducement, provided continuous promotion and regular increases in salary, and the assurance of a satisfactory career, with the benefit of an endowment at the age of 55. Some of the company's work required men and women of high educational attainments. Every one of the executive directors of the company and most of the directors of the subsidiary companies had been promoted from the management. The endowment scheme was provided entirely at the expense of the company, the amount depending upon the length and form of service between the ages of 20 and 55, and was adjusted yearly.

In the educational scheme advantage was taken of the municipal educational institutions, and provision was made not only for intermediate and higher education, but also for those who required preparation for such work. All subjects, including training in commercial subjects, foreign languages, engineering and pure science were included in the system. Students were advised by the staff bureau as to the subjects which they should study. Although the scheme was inaugurated only in January last, yet, out of 200 students enrolled, 120 were prize winners. Some of the prizes would be accompanied by an immediate increase in salary, and in all cases individual success would be noted by the staff bureau in such a way as to ensure recognition when the opportunity for promotion occurred. The policy of the directors was to secure and retain the services of youths and girls of ability and to give them every facility and encouragement to advance. Their aim was efficiency, and the schemes were regarded by the directors as a matter of business. They also felt that by encouraging habits of study they were promoting the general welfare of members of the staff.

The Lord Mayor, in distributing the prizes, congratulated the company and the employees upon a scheme which he believed was of a pioneer character. It emphasised the personal interest which he thought ought to be taken by a great firm in the welfare of those who served it, and marked an advance in the relations between employees and employers. He hoped similar schemes would be adopted by other great concerns.

MOTOR OMNIBUSES AT CHELMSFORD.

In a report to the Chelmsford Corporation with reference to the motor omnibus service provided by the National Steam Car Company, the Special Purposes Committee stated that they had had an interview with Mr. Banks regarding the licences granted by the Corporation authorising the company's omnibuses to ply for hire in the borough of Chelmsford and the routes used by the omnibuses, fares charged to passengers, and the time table of services. It was explained that as the Council granted the necessary licences to the company, the Council should exercise some general control over the omnibuses and the fares charged. The National Steam Car Company agreed that the company would in the future, before altering the time table, stopping places, or fares, submit particulars for the Council's information. Although the fares now charged appeared somewhat high in comparison with pre-war fares, the sub-committee was informed that the company, owing to the great increases in running expenses, etc., were not making the same profit as before the war.

The sub-committee also reported that they have considered and approved the stopping places to be observed by the new steam omnibus which the National Steam Car Company, Limited, propose to commence running in the borough. This new omnibus will run from the Shire Hall to various parts of the borough, and the sub-committee have approved a fixed fare of 1d. being charged by the company to all passengers using this omnibus between the Shire Hall and any part of the borough.

Mr. Walter Bond of the St. Helens Cable and Rubber Company, Limited, has been appointed Chairman of the Solid Tyre Committee of the British Rubber Manufacturers' Association, subsequent to the retirement of Mr. W. H. Paule, of the Dunlop Rubber Company, Limited. He had previously filled the post of honorary technical secretary to the association.

MOTOR VEHICLES FOR MUNICIPALITIES.

Stretford Urban Council are using motor wagons.

The Port of London Authority are using an electric ambulance.

Calcutta Municipal Council have arranged for the purchase of a motor car.

Bradford Guardians have decided to purchase a motor hearse at a cost of £295.

Essex Standing Joint Committee are purchasing another motor car for the use of the police.

Ilford Urban Council wish to purchase a second hand petrol lorry of about two tons capacity.

Manchester Corporation Gas Committee are purchasing a Renault motor van from Mr. Gerald Dugdale for £225.

Manchester Corporation Health Committee propose to get a Ford car at a cost of £250 for the Drinkwater Park Hospital.

Electrics for Refuse Collection.—Willesden Urban Council are considering the purchase of electric vehicles for the removal of house refuse.

Walsall Motor Omnibuses.—Seven of the Walsall Corporation motor omnibuses and one transport lorry are to be enrolled in the Motor Volunteer Corps of the county of Stafford.

Halifax Corporation Motors.—A special committee has been appointed by the Halifax Corporation to consider the advisability of centralising the control of all motor vehicles belonging to the Corporation. The committee comprises a representative from each department using these vehicles.

TWO NAPIER VANS.

The two Napier vans shown in the accompanying illustration form part of a fleet of Napier business vehicles in use by Messrs. Maple and Company, of Tottenham Court Road. This firm was one of the pioneers of motor transport, and their foresight has been of great service to the Government, as they are large suppliers of hospital appliances. Out of evil cometh good, and unquestionably

this war has proved the value of motor transport with a completeness which could not have been hoped for under any other circumstances. The demonstration thus afforded of the advantages of mechanical transport will certainly lead to an enormous development after the war.

Road Maintenance in Birmingham.—In his annual report, Mr. H. E. Stilgoe, city engineer and surveyor to Birmingham Corporation, states that despite the shortage of labour and materials the highways have been kept in a reasonable state of repair. Repairing macadamised streets cost £131 10s. 4d. per mile; granite pavements, £111 6s. 10d. per mile; wood pavements, £248 5s. 3d. per mile. The area of wood pavement under maintenance contract with the Improved Wood Pavement Company is 128,866 sq. yds. The amount paid during the past year for such maintenance was £5,118, being at the rate of 9·53d. per sq. yd. The approximate area of wood pavement maintained directly by the Corporation is 203,314 sq. yds., the cost of which during the year was £1,796, being at the rate of 2·12d. per sq. yd. The economical and sanitary benefits of tar spraying had become increasingly apparent. The cost of this work during the year was £17,112, being at the rate of 1·01d. per super yard.

Digitized by Google

MOTOR TRAFFIC.

MOTOR TRAFFIC NOTES.

NEW INDEX MARK FOR CHESTER.—The Local Government Board have assigned "MA" to the county of Chester as a new, and second, motor index mark.

SHEFFIELD CORPORATION propose contributing three guineas annually towards the expenses of the Electric Vehicle Committee of the Incorporated Municipal Electrical Association.

EXCESSIVE TRAFFIC.—The Road Board have agreed to contribute to the Willesden Urban District Council the sum of £1,044 towards the repair of Acton Lane, owing to the excessive traffic from the munition works in the district.

MEAT BY MOTOR.—Chelmsford Corporation have suggested to the Food Ministry that arrangements should be made for meat to be sent by road motor transport, with a view to expediting delivery and preventing waste of food.

LONDON COUNTY COUNCIL.—The report of the London County Council Fire Brigade shows that out of a total of 186 vehicles no fewer than 173 are motor driven. These comprise 87 fire engines, 80 escapes, and 6 long ladder vehicles.

INCREASING MILEAGE COSTS.—A statement prepared by the accountant of Willesden Urban District Council with reference to the cost per mile of the motor service for the year ended March 31 last shows a charge of 13·64d. per mile, as against 11·70d. per mile for the previous year.

A Fleet of Napier Lorries for the War Department.

FREE AMBULANCE REGISTRATION.—The Magistrates' Committee of the Glasgow Corporation have reported in favour of granting an application of the St. Andrew Ambulance Association for the free motor registration of a new motor ambulance.

TIRE STANDARDISATION IN THE U.S.A.—As the result of negotiations with the American War Industries Board, the motor tire manufacturers in the United States have agreed to reduce the numbers of separate lines of tires from 287 to 32. This step is to be effected gradually by the end of November, 1920.

HISTORY OF WAR MOTOR TRANSPORT.—According to the *Commercial Motor*, Lieutenant N. Beveridge has been given a staff appointment at General Headquarters in France in order to prepare a history of motor transport in the war. His duties take him to every point of the front. When a corporal in the early period of the war he drove transport department and service vehicles for many months.

PERTH MOTOR OMNIBUSES.—A report presented to the Perth Town Council shows that the motor omnibuses account started the year with a debit balance of £1,135, to which has to be added the loss on the year's working of £60, and the hire purchase instalment, £480, making a total loss on the working of the omnibuses to Whit-Sunday, 1918, of £1,681. It is estimated that the loss during the current year will be £189.

ELECTRIC TIPPING GEAR.—Reporting to the Ilford Electricity Committee, the manager stated that he had inspected the electric tipping gear in use on the Orwell wagons, and considered it thoroughly satisfactory, and preferable to the unloading gear. The price quoted by the makers was £50, against £70 for the unloading gear, and he therefore suggested that the electric tipping gear should be adopted for use with the Orwell wagon. The committee acquiesced.

MANCHESTER-LIVERPOOL RETURN LOADS BUREAU.—Just over a year's experience of the return load system for motor vehicles running between Manchester, Liverpool, and other centres in East Lancashire has shown that it has filled a great want. The scheme is managed by the Chambers of Commerce of the two cities. The tonnage carried during the first six months was 2,225, while in the second half-yearly period ended in August last 11,632 tons of material were transported. The bureau was the first to be formed in this country.

HEAVY ROAD TRAFFIC.—At Perthshire Highland District Committee letters were read from the Marquis of Breadalbane as to damage to roads and bridges in the district by heavy timber haulage The surveyor reported that nearly all the main and secondary roads were affected, but the Road Control Board had decided that timber hauliers were to be relieved of all responsibility for damage to roads provided they complied with the regulations and went by routes laid down. Assistance for the extraordinary traffic would be given to local road authorities provided they did all in their power to maintain the roads in a fit condition.

HIGHWAY CONTROL.—The subjoined further statement with reference to highway control has been issued by the Council of the Institution of Municipal Engineers :—Following upon the resolution which was carried at the last meeting, copies of which were sent to the departments concerned, it was decided to approach the Road Transport Board with a view to obtaining full representation on Divisional Road Transport Boards and Area Transport Committees. As matters are at present, county interests only are represented, and it is felt that borough, urban, and rural districts should have equal representation, having regard to the mileage of the highways which they control.

COKE FUEL FOR STEAM WAGONS.—A recent issue of the *Sentinel News*, the house journal of the "Sentinel" Wagon Works, Shrewsbury, says :—"We have consistently advocated the use of coke as a fuel in steam wagons. Our issue of February last contained an actual working record of a 6-ton Sentinel wagon which carried nearly 6½ tons at a penny a mile over a run of 21 hours, burning ordinary gas coke at 25s. a ton. With a properly designed steam wagon coke is the cleaner fuel, and it gets rid of the difficulties caused to owners of wagons requiring coal by the very necessary coal control regulation which compels the use of local coal, thus economising railway transport."

ROAD TRANSPORT ORDER.—The secretary of the Commercial Motor Users' Association has communicated with the Road Transport Board with reference to the position in which the numbers which have been issued by the Board, and which have to be displayed upon the vehicles, should be placed, and has received a reply from the secretary to the Board stating that so long as vehicles are legibly marked with the transport registration number the Board do not intend to insist that the number should be placed in any particular position. It is, however, suggested that the number should be marked on the near side of the vehicle following the name and address which is already in most cases thereon.

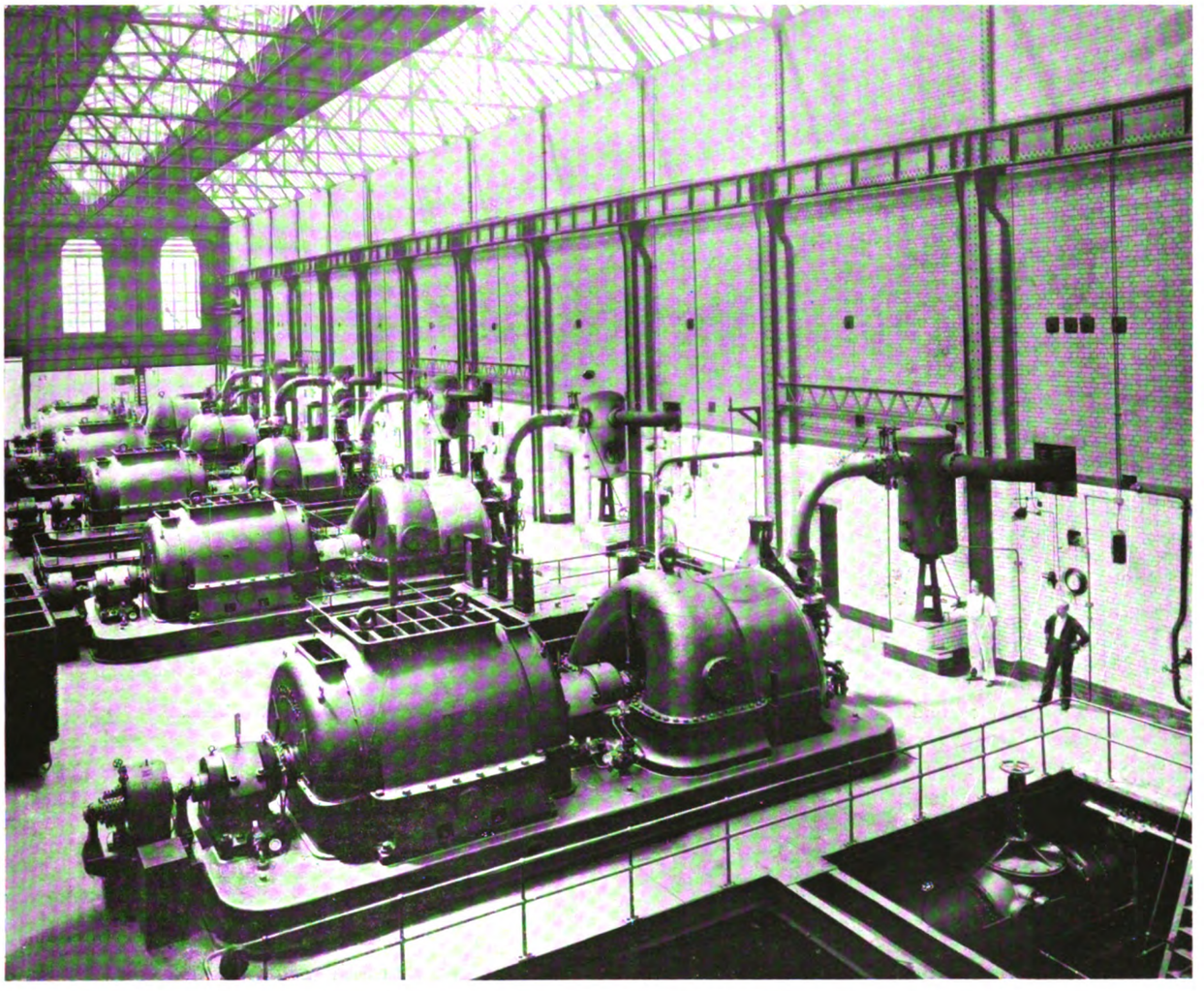
Digitized by Google

THE Tramway & Railway World
WITH MOTOR TRAFFIC SECTION

Founded 1892. LONDON, NOVEMBER 14, 1918. VOL. XLIV.

THREE YEARS OF ELECTRIC TRACTION ON THE SOUTH WESTERN RAILWAY.

At the end of October occurred the third anniversary of the beginning of regular service by electric traction on the London and South Western Railway between Waterloo terminus and Wimbledon, via East Putney. Early in the following year the service was extended to the Kingston and Richmond loop and the Shepperton branch, and before the end of that year electric trains were running to Hounslow, Hampton Court, and Claygate, completing the whole of the scheme that was then in hand, comprising 47 route miles. A great improvement was at once made in the service. Stops at stations were cut down, and this, coupled with rapid acceleration and higher maximum speed than had been given by the steam trains, reduced the schedule time appreciably. The intervals between trains were also shortened, and a ten-minutes' service of electric trains was run on the Kingston loop, which is one of the most important of the suburban services. The company have made good use of new opportunities, and the public have been quick to appreciate the improvement, with the result that traffic has largely increased. Although the exact figures have not been divulged, it is known that the directors are well satisfied with the equipment and the results that have been obtained.



Engine Room of London and South Western Railway Electric Power Station.

Digitized by Google

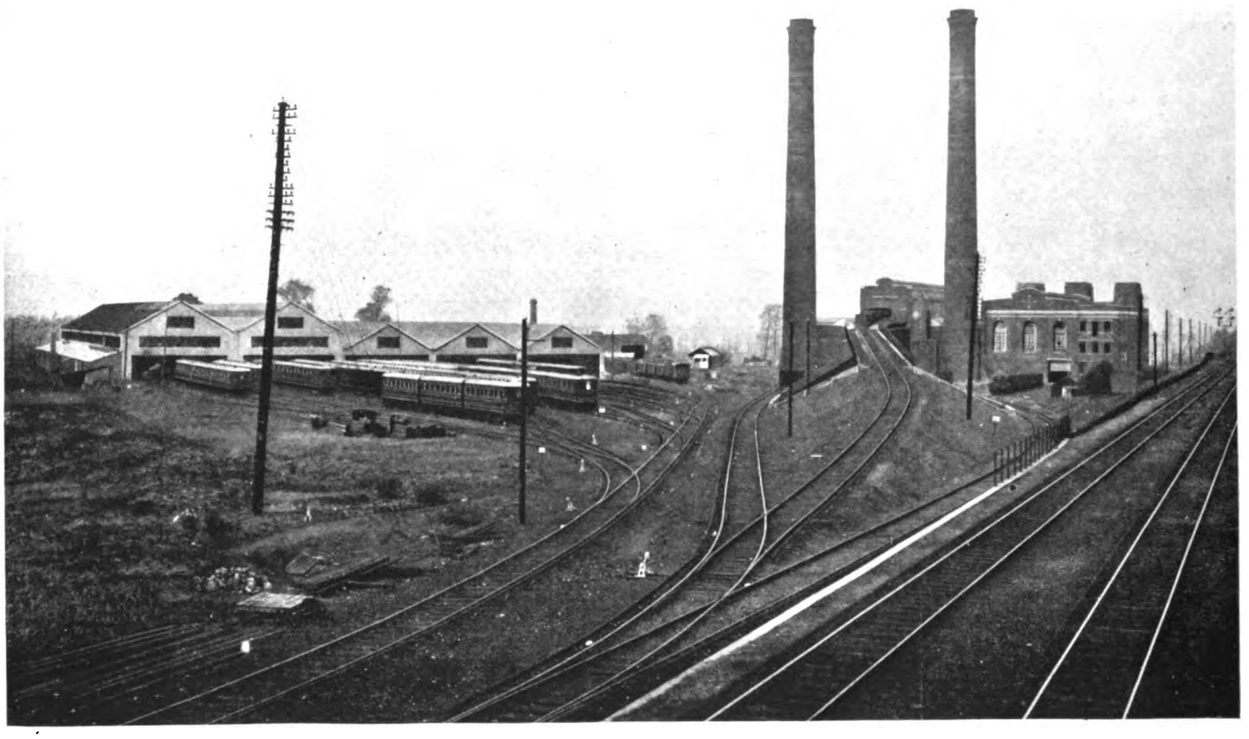
A full description of the installation was given just after the opening of the first section in our issue of November, 1915. This included illustrations of the interior of the power-station, in which not all of the power units were then completed. The engine-room as it now appears is illustrated in the accompanying photograph, for which we are indebted to Messrs. Dick, Kerr and Company, the contractors for the turbo-alternators, which comprise six main sets of 5,000 KW. capacity each. The interior, of which a portion is shown in the photograph, measures 257 ft. long by 55 ft. wide. The main generators run at 1,500 revolutions per minute, and produce three-phase alternating current at 25 cycles at a pressure of 11,000 volts.

There are also three auxiliary sets, consisting of Parsons' turbines driving Dick-Kerr direct current generators through reduction gearing. These turbines run at 5,000 revolutions per minute, and the generators at 575. The output of each unit is 400 KW. at 220 volts. The turbines are of the high pressure impulse type, and run at 1,500 revolutions with a pressure of 200 lb. per square inch, the steam being superheated at 200 deg. Fahr.

The main alternators are connected to the turbines by flexible couplings, and are rated at 5,555 KVA. They yield three-phase current at a pressure of from 11,000 to 11,500 volts. Each machine has its own exciter mounted on the end of the shaft, and is of the totally enclosed chimney ventilated type. The steam pipes are arranged on the unit system, a group of boilers supplying each main turbine, but the boilers and turbines can be opened out to a 14-in. common main in order to give greater flexibility in working. The steam is taken from each boiler by a 7-in. pipe, and these pipes lead into a 10-in. main. Condensed steam is removed by separators.

The power-station adjoins the main line at Durnsford Road, Wimbledon, and immediately adjacent are extensive car sheds and repair shops. The site is well situated for the distribution of electricity to the suburban lines. For condensing purposes water is taken from the River Wandle, which is near at hand, and as the ground slopes gradually towards the power-house and the river, it was possible to arrange for the discharge of coal from the railway wagons directly into the bunkers of the boiler-house.

The electrical equipment of the rolling stock, which has given very satisfactory service, was provided by the British Westinghouse Electric and Manufacturing Company. The trains are made up of three coach units, consisting of two motor coaches with a trailer coach close coupled between them. Each train is equipped for multiple unit working, and the individual three coach units, which form convenient and handy units for traffic, are intended to be permanently coupled. The three-coach train weighs 94 tons empty, and seats 190 passengers. It is equipped with four 275-H.P. motors, running at 500 revolutions per minute. The motors are arranged in pairs on the bogies underneath the driving compartments at the opposite ends of the unit.



London and South Western Railway Electric Power Station, Trains, and Train Sheds.

The successful operation of the electric trains during the past three years, the great addition to the capacity of the railway, and the immense gain in public convenience and comfort form convincing demonstrations of the great advantages of electric traction in railway service. The results obtained have not been without influence in official quarters where the desirability of applying electricity to railway operation as soon as possible is, it is understood, now fully recognised. Progress in this direction has been lamentably slow, but there is now a good prospect that electrification will be undertaken on a large scale.

Digitized by Google

CENTRAL ARGENTINE RAILWAY ELECTRIFICATION.

(*Continued.*)

Condensing Plant.

The condensing water is taken from a pump house on the River Lujan through two 27-in. diameter pipes about 500 yards long, and is discharged into a small creek somewhat nearer the power station, called the Rio Rosquetes. The condenser shells are cast iron and the tube plates are rolled brass $1\frac{1}{8}$ in. thick. The tubes are $\frac{3}{4}$ in. external diameter and are solid-drawn copper of No. 18 S.W.G. Aluminium blocks are fixed in the water chambers in metallic contact with the tube plates. The air and water extraction pumps, together with their driving motor, are mounted on one bedplate.

The circulating water-pump bodies are of cast iron and the impellers are of gun-metal. The circulating water-pump motors are housed in a steel-framed, corrugated iron-sheeted house, erected on a wooden jetty projecting from the bank of the river. The site of the jetty was dredged before the wooden jetty piles were driven and each pump is mounted in a tank, so that its centre line is approximately at high water level. The suction pipe is carried to such a depth as to ensure its being submerged in all states of the river. One side of the jetty consists of two screens of expanded metal, arranged so that one screen at a time can be raised for cleaning. Flexible couplings are provided between the motors and the pumps to allow for settlement and straining of the jetty.

In addition to the main circulating-pump motors the jetty carries a centrifugal pump capable of delivering 300 gallons per minute against a head of either 20 or 95 ft. This supplies water through a 6-in. diameter pipe, either to the purified water reservoir or direct to the storage tanks in the pump house. Two motor-driven air exhausters are also located in the pump house, each capable of producing in three minutes a vacuum of 20 in. in any one of the main pumps, including its suction pipe and discharge pipe up to the discharge valve.

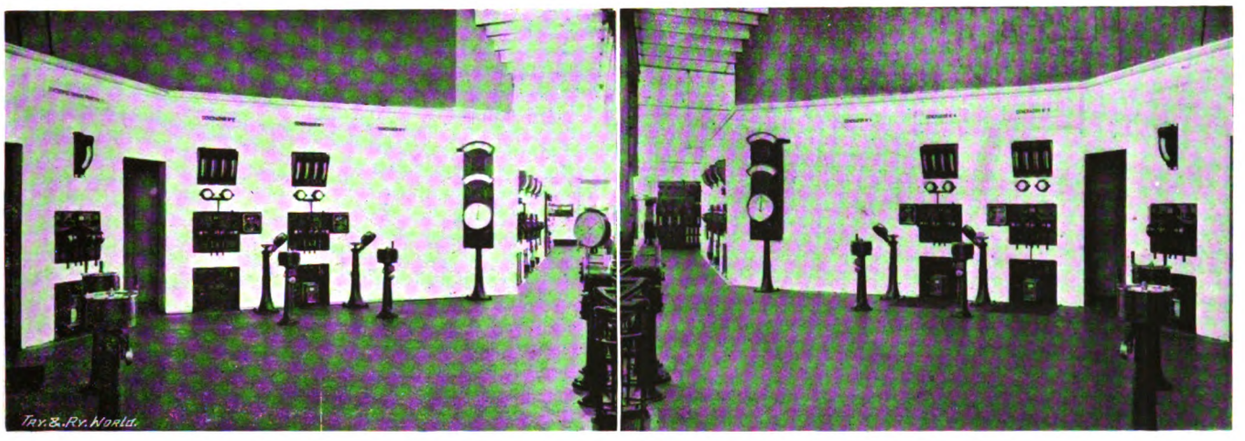
The main pump motors are started by means of oil-immersed auto-starters, consisting of two separate single-phase transformers and the starting switch. Each motor is connected by a separate cable to one of the unit distribution boards in the power house.

Owing to the swampy nature of the ground between the river and the station, it was not possible to lay the circulating water pipes direct in a trench. Instead they were erected on cross bearers carried by pairs of wooden piles driven down to the tosca. The cables are carried on angle irons supported from the cross timbers. Where the inlet pipes cross the Rio Rosquetes they are carried on a steel girder bridge. The pipes are of steel and are lapped with tarred Hessian tape.

Power Station Switchgear.

All main switching is carried out at 20,000 volts. The main switchgear is located in a bay on the side of the engine room opposite to the pump house and boiler house, the operating gallery being raised about 4 ft. above the engine room floor so that the operator has a good view of all the machines. The generator panels, which are in the middle of the gallery, are set round a recess so that all the instruments and gear can be seen from one position (Figs. 8 and 9). The station transformer and feeder panels stand on either side of the generator panels parallel to the axis of the engine room.

Each operating panel consists of two cast-iron plates built into a wall of moulded concrete, 11 ft. high, faced with glazed tiles; this wall is set forward 3 ft. from the main panels and at the back carries the auxiliary wiring which is run as vulcanised indiarubber cable on porce-



Figs. 8 and 9.—Generator Panels of Main Switchboard.

lain racks. In the case of the generator panels the instruments (of the edgewise pattern and comprising an ammeter, voltmeter, power-factor meter, and indicating wattmeter) are mounted on the wall above the upper cast-iron plate. Below them are the red and green indicating lamps, which show whether the oil switch is closed or open. The upper cast-iron plate carries the oil switch operating handle, and, interlocked with it, the handles controlling the cable and busbar isolating switches. Below the oil switch lever are the automatic trip coils, and above it the time limit fuses. The voltage regulator is mounted on the wall to the left of the plate. The bottom plate carries the integrating wattmeter, the exciter field switch, the governor control switch, and the change-over switches for the voltage regulator and the ammeter.

In front of each generator panel is a pedestal carrying the exciter ammeter and the handwheel (Figs. 8 and 9) which operates the exciter field rheostat, mounted on an intermediate floor in the basement. A second pedestal carries the transmitter of an electrically-operated telegraph by means of which the switchboard attendant can communicate with the driver when synchronising. Similar instruments mounted at the front of the gallery give communication with the boiler house.

Digitized by Google

The main panels are formed of moulded concrete cubicles 5 ft. wide ; the main wall is 9 in. thick, and the sides of the cells are 4 in. thick. Intermediate floors, 4 in. thick, separate each cubicle into five storeys, which (starting from the bottom) are occupied as follows :—

(*a*) Potential transformers (Fig. 10) ; (*b*) cable isolating switches and current transformers ; (*c*) oil switch (Fig. 11) ; (*d*) busbar isolating switches ;

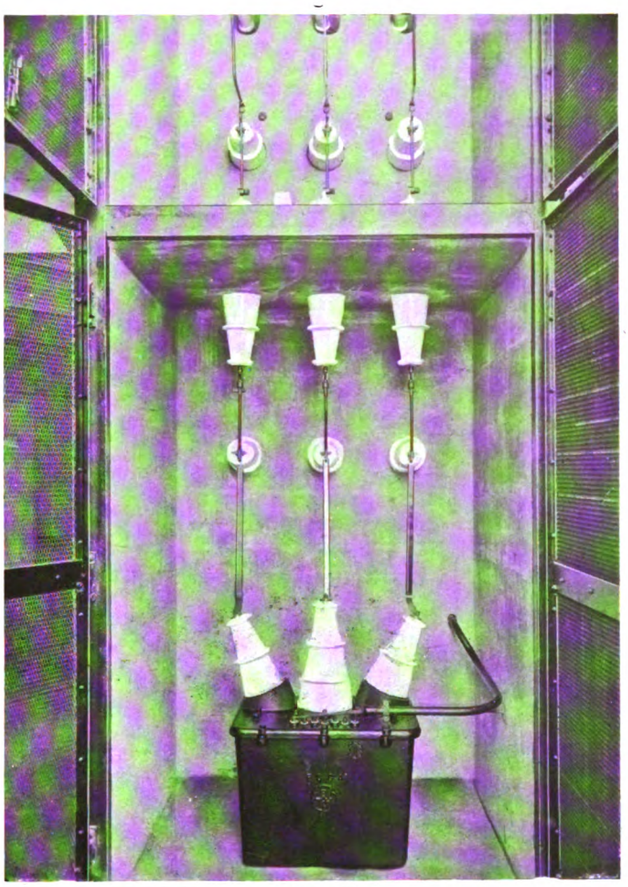


Fig. 10.—Switchgear Cubicle with Potential Transformer.

(*e*) busbars. The different compartments are protected by screens of expanded metal, interlocked with the isolating switches, so that they can be opened only when these switches are open. The whole structure was moulded in position, the holes for the apparatus being cored out so that no cutting of the work was required. Porcelain only is used for insulation and in general connections are made with bare copper, a minimum spacing of 15 in. between phases and to earth being adopted ; where there is risk of conducting fumes causing short circuits the leads are covered with porcelain tubes. Small wiring in the cells is kept down to a minimum, and is run as rubber-covered cable on porcelain cleats.

The three phases of each high tension switch are contained in one tank, which is built up of wrought-iron plates, with special stiffening channels to take care of the maximum pressure generated in the tank when the switch opens on a fault. A vent pipe leads from the top of the tank to the outside of the switch cubicle to carry off any gases that may form. The leads to the switch terminals are introduced into the tank through cast-iron " U " bends filled up solid with compound. Provision has had to be made for the expansion of this compound in hot weather, otherwise the bends or porcelains are liable to crack.

The current transformers are compound-filled and ironclad. They are of two types, one suitable for mounting against a wall, the other passing through the floors between the compartments of the panels. The use of the latter saves floor insulators and economises space. On the generator panels current transformers are provided for the instruments, the protective devices and the voltage regulators.

The potential transformers are oil-immersed and self-cooled. Isolating switches and fuses are installed between them and the cable terminals, so that a faulty transformer can be isolated from the rest of the switch gear.

Permanent testing busbars are provided in the generator panels, connection to the main switch being made by removable jumpers. A water resistance was provided for taking the load of a generator under test ; it consisted of three sets of wooden tanks mounted on insulators and with a partition down the middle. The water passes up one compartment and down the other, leaving the tank at the end at which it entered. The dimensions of each tank are :—Length of water column, 6 ft. ; width, two columns each 9 in. wide ; depth, 1 ft. 6 in. The leads are attached to plates slung from a carriage which can be moved along the tank to regulate the load on the generator. During the tests

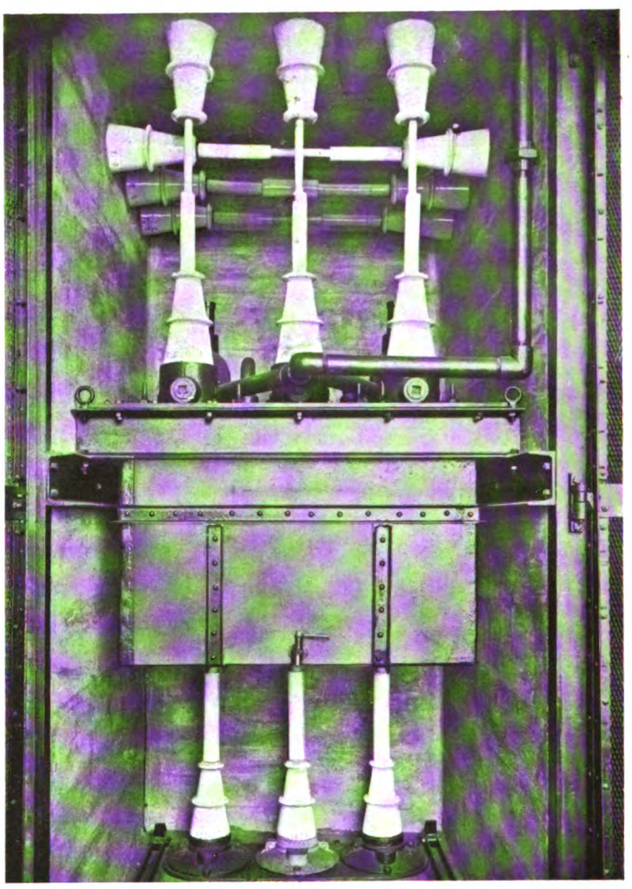


Fig. 11.—Switchgear Cubicle with Oil Switch.

on the machines, considerable difficulty was experienced in preventing the sides of the tanks from charring, and ultimately concrete tanks were constructed.

The unit distribution boards are built up of enamelled slate panels and have the busbars mounted in front ; porcelain handle fuses connect the busbars to studs which pass through the slate to the motor leads at the back. The oil switch controlling the feeder cable

Digitized by Google

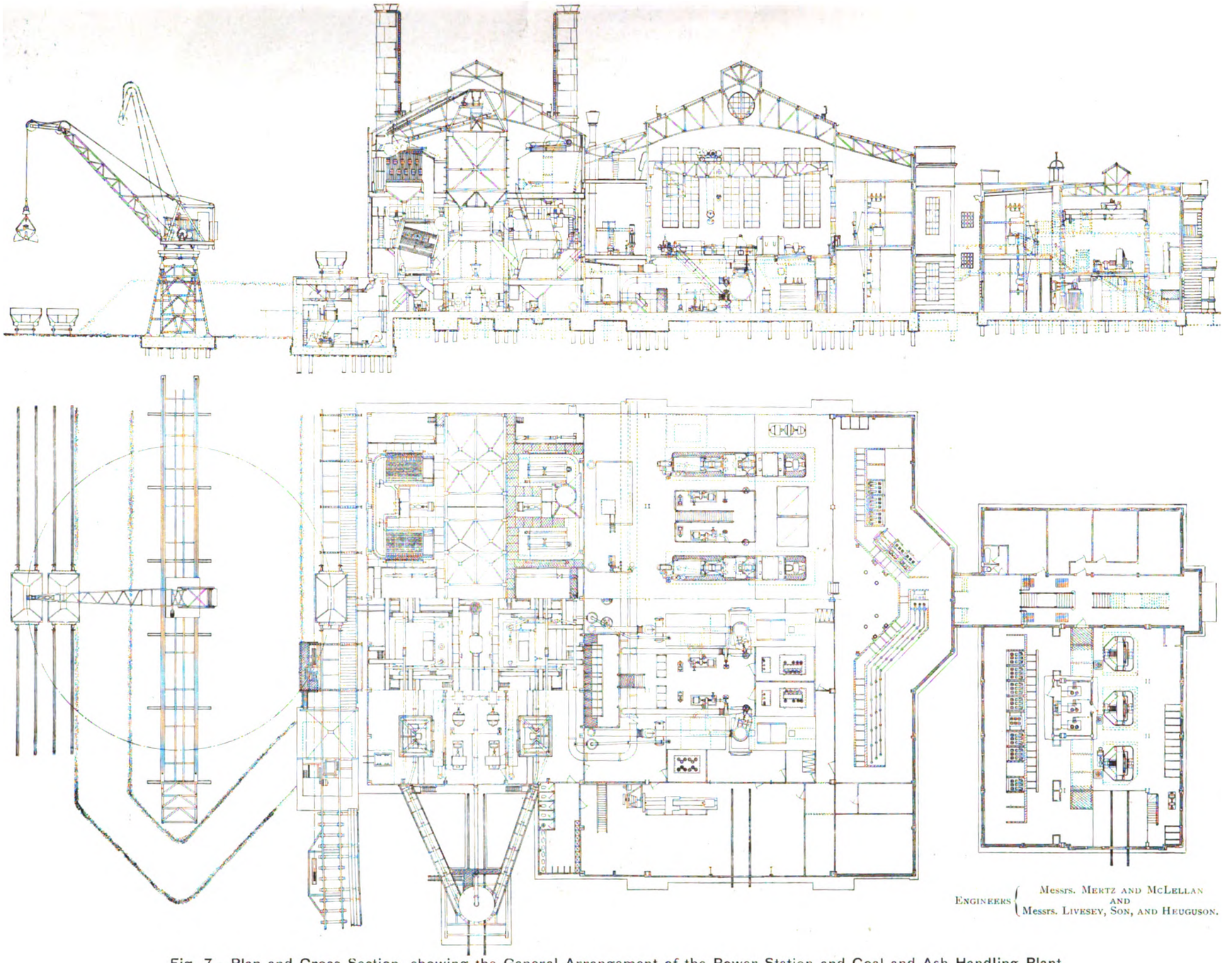


Fig. 7.—Plan and Cross Section, showing the General Arrangement of the Power Station and Coal and Ash Handling Plant at San Fernando, Central Argentine Railway.

Digitized by Google

Digitized by Google

from the unit transformer is mounted at the back of the panel along with the current transformers for the trip coils and instruments. Busbar isolating switches are mounted on the front of the incoming feeder panel.

The main motor distribution board is of slate panels similar to the unit distribution board. It is surrounded with expanded metal to prevent articles from falling on it from the engine room floor above.

Feeders are run from the station distribution board to the station auxiliaries and also to the unit distribution boards, so that the latter can be made alive when a supply is not available from the unit transformers, e.g., when starting up or shutting down a generator. In order to avoid any risk of paralleling a generator out of phase through its unit transformer the switches on the two feeders to each unit distribution board (viz., from the unit transformer and the station distribution board) are interlocked, so that only one can be closed at once. They are also so arranged that the change-over from one supply to the other can be so quickly effected while the auxiliary plant is running, that there is no appreciable drop in the speed of the motors.

At each end of the switchboard gallery is installed a 110-volt d.c. board to control the supply from the lighting motor-generators to the lighting circuits and the batteries. Two 250-ampere-hour Tudor batteries provide current for the indicating lamps on the main switchboard, the trip coils of feeders, electric telegraphs and a stand-by to the lighting system. The end cells of each battery are cut in or out of circuit by a solenoid-operated remote-controlled regulating switch.

The switchgear in the jetty pump house consists of seven ironclad switch panels.

The protective gear used for all high pressure apparatus in the power station and on the system is of the Merz-Price type. Low tension panels with oil switches are equipped with overload trip coils and time-limit fuses.

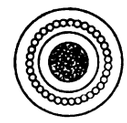
Cables.

When the scheme was under consideration the split conductor system of feeder protection had not been sufficiently tried out to justify its adoption in foreign work of such importance. Accordingly the high-tension transmission system consists of 20,000-volt underground feeders, with three simple cores, and of pilot cables for the protective devices. A system of telephone cables was also installed. Two high-tension cables are laid through the streets from the power station to the nearest point of the electrified railway track. Then they run, one on each side of the line, to Olivos sub-station, the western one being looped into Victoria power and lighting sub-station. A third feeder is taken from the power station to Olivos along the track *via* Anchorena. Two feeders run from Olivos sub-station to Palermo sub-station and two from Palermo sub-station to Retiro power and lighting sub-station.

The high-tension cables (Fig. 12) are ·1 sq. in. in section, 3-core, paper-insulated, lead-covered, single-wire-armoured; the pilot cables for the protective gear are ·005 sq. in. in section, 3-core, paper-insulated, lead-covered, single-wire-armoured; the telephone cables are 8-pair, dry-core, air-spaced, paper-insulated, lead-covered, single-wire-armoured, and suitable for the use of superimposed circuits where necessary. Both below and on top of the armour all cables are served with specially compounded waterproof preservative coverings.

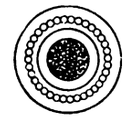
In general the three types of cables are laid in the same trench at a distance of about 1 in. from each other. Above the high-tension cable and about 4 in. from it is laid a creosoted plank, 8 in. by 2 in., to protect the cables in case of future excavations. The high-tension cables were shipped on drums in lengths of 100 metres. On the Company's land the cable trenches were kept as far away as possible from the rails, the depth of the trench being at least 1 metre. Where an embankment extended to the boundary fence the trench was taken down till undisturbed ground was reached. Where the cables cross bridges they are supported on cast-iron racks attached to the structure. Sheet steel

EIGHT-PAIR CORE TELEPHONE CABLE INSULATED WITH PAPER, LEAD COVERED, WIRE ARMOURED, AND SERVED.



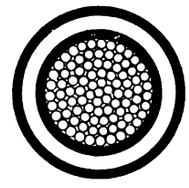
Section of each conductor ...	·001 sq. in.
Number of wires in each strand	1
Diameter of each wire	·091 cms.
Weight per metre of cable ...	3·20 kgs
Thickness of lead sheath ...	·25 cms·
External diameter over all ...	3·40 cms.
Number of armouring wires	32
Diameter of armouring wires ...	·234 cms.

600 VOLT 3-CORE PILOT CABLE, INSULATED WITH IMPREGNATED PAPER, LEAD COVERED, WIRE ARMOURED, AND SERVED.



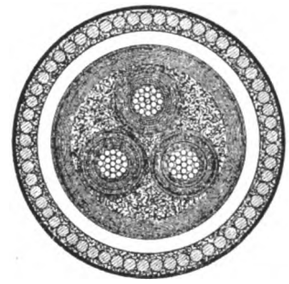
Section of each conductor ...	·005 sq. in.
Number of wires in each strand	3
Diameter of each wire... ...	·122 cms.
Weight per metre of cable ...	3·33 kgs.
Thickness of lead sheath ...	·25 cms.
External diameter over all ...	3·42 cms.
Number of armouring wires	33
Diameter of armouring wires ...	·234 cms.

800 VOLT SINGLE CORE TRACK CABLE, INSULATED WITH IMPREGNATED PAPER, BITUMEN SHEATHED AND SERVED.



Section of each conductor ...	1 sq. in.
Number of wires in each strand	91
Diameter of each wire	·3 cms.
Weight per metre of cable ...	7·41 kgs.
Thickness of bitumen sheath ...	·46 cms.
External diameter over all ...	5·38 cms.
Number of armouring wires ...	—
Diameter of armouring wires ...	—

20,000 VOLT 3-CORE CABLE, INSULATED WITH IMPREGNATED PAPER, LEAD COVERED, WIRE ARMOURED AND SERVED.



Section of each conductor ...	1 sq. in.
Number of wires in each strand	19
Diameter of each wire	·211 cms.
Weight per metre of cable ...	22·33 kgs.
Thickness of lead sheath ...	·35 cms.
External diameter over all ...	9·17 cms.
Number of armouring wires	60
Diameter of armouring wires ...	·406 cms.

Fig. 12.—Sections of High and Low Tension Cables.

covers are fixed over the troughs to shield them from the direct rays of the sun.

The feeder from the power station to Olivos *via* Anchorena is taken across the Canal San Fernando, which is navigable for barges and small boats, in a concrete tunnel driven under in the bed of the canal. The internal diameter of the tunnel is 3 ft. and of the shafts 4 ft.

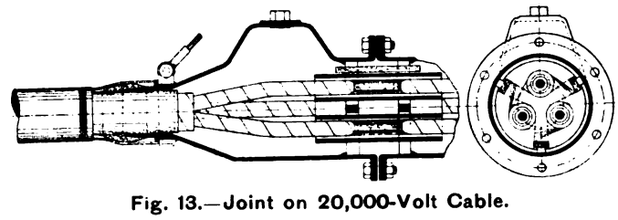


Fig. 13.—Joint on 20,000-Volt Cable.

All joints in the high-tension cables were made in gun-metal sleeves (Fig. 13) wiped to the lead of the cable, the sleeves themselves being surrounded by a creosoted wooden box with an iron cover. The sleeves were filled with compound, great care being taken to avoid producing cavities in the filling. Wherever the armouring is interrupted the joint is spanned by a copper bond of ·05 sq. in. section. After laying and

Digitized by Google

jointing, the high-tension cables were tested by applying for 15 minutes a pressure of 40,000 volts between any core and the lead and between any two cores.

The direct-current feeders from the sub-station to the track and the jumpers spanning gaps in the conductor rail are of 1 sq. in. section, paper-insulated, vulcanised-bitumen-sheathed, taped and braided. They are laid solid in Key's fibre conduit filled with Trinidad bitumen. The conduits are $4\frac{3}{8}$ in. external diameter and about 5 ft. long, the joints between conduits being made by fibre sleeves. The cables are supported in the conduits by fibre bridges. A creosoted plank is laid over the conduits.

The telephone system installed in connection with the electrification works provides communication between the power station and the sub-stations, the car sheds and the signal cabins in the electrified area. Twenty-two wire exchanges of the Sterling automatic type are installed at Victoria and at the power station.

Traction Sub-Stations.

The line at present electrified is served by three traction sub-stations situated respectively as follows :—

San Fernando sub-station about $1\frac{1}{2}$ miles from the outer end of the line.

Olivos sub-station about midway along the line.

Palermo sub-station about $2\frac{1}{4}$ miles from the city terminus. (Between Palermo and the terminus four tracks are equipped electrically.)

The buildings are all of the same general design, being steel-framed structures walled with brick covered with armoured cement plaster. The floors and roof are concrete reinforced with Clinton fabric, the roofs being flashed with $\frac{3}{4}$ in. of rock asphalt. Palermo sub-station is surrounded by a public park, and the Government consequently called for a more ornate structure than was required for the others. Provision is made at the sub-stations for housing the attendants.

Each building is divided into three main aisles, the centre one containing the rotary converters and transformers, and the side ones containing the high-tension and direct-current switch gear respectively. There is a loading bay at one end into which a siding comes, so that railway trucks can be brought under the overhead crane which traverses the whole building. Provision is made for extension of the building at the end away from the loading bay when it is necessary to instal further converter sets. The basement contains the main transformers, the potential and current transformers, the high and low tension feeders, rotary field rheostats, and battery. On the first floor are situated the rotaries, the 800-volt switchgear, a motor generator, and, on a raised gallery, the high tension operating gear.

The high-tension gear is similar to that in the power station ; the busbars are sectioned and interconnected by an oil-sectioning switch, the two halves of the bars being fed by different cables.

The direct-current switchboard is built up of panels supported on a pipe framework. A single-pole circuit-breaker with overload and reverse current tripping coils, and a knife switch which isolates the circuit-breaker from the busbars, are mounted on a marble panel at a height of about 8 ft. from the floor (Fig. 14). Marble partitions between adjacent panels form separate cubicles, and prevent the arc from a breaker which opens on a fault from travelling to adjoining switches. The switches are operated through wooden rods and porcelain insulators by handles which project through cast-iron panels mounted about 14 inches in front of the marble slab. In this way all live metal in front of the board is placed out of reach of a person standing on the floor. The generator panels carry handwheels for operating the rotary field rheostats which are mounted in the basement directly below the board. Differential relays are provided to prevent a circuit-breaker being closed when the polarity of its rotary is reversed. These operate in conjunction with indicating lamps, which light up in such circumstances.

In the table below particulars are given of the principal plant in the traction sub-stations. The

Details of Plant in Traction Sub-Stations.

Number of rotary converter sets at present installed...	In sub-station at Canal San Fernando, 3. Do. Olivos, 3. Do. Palermo, 3.
Type of rotary converters	British Thomson-Houston Company's compound-wound ; commutating pole ; six-phase diametrically connected.
Output of rotary converters ...	1,000 KW. at 800 volts, normal rating ; 1,500 KW. for two hours ; 2,000 KW. for ten minutes ; 3,000 KW. momentarily.
Type of rotary converter transformers	British Westinghouse Company's ; single-phase ; oil-immersed ; naturally-cooled.
Capacity of transformers	375 KVA.
Type and capacity of station transformers	British Westinghouse Company's ; three single-phase ; oil-immersed ; naturally-cooled ; each of 20 KVA. capacity ; ratio of transformation 20,000 to 440 volts.
Type and capacity of station lighting transformer ...	British Westinghouse Company's ; one single-phase ; oil-immersed ; naturally-cooled ; 10 KVA. capacity ; ratio of transformation 440 to 110 volts.
Type and capacity of motor generator	British Thomson-Houston Company's ; 5 KW. capacity ; a.c. voltage 440 ; d.c. voltage 110.
Type and capacity of air compressor	Alley and McLellan ; 39 cub. ft. of free air per minute at a pressure of 60 lb. per sq. in.
Type and capacity of ventilating fans	Blackman ; 25,000 cub. ft. of air per minute.
Type and size of secondary battery	Tudor Accumulator Company's ; 50 ampere-hours.

rotary converters (Fig. 14) are self-synchronising, and are started from tappings on the low-tension side of the transformers by an oil immersed controller. Provision is made for coupling negative boosters to the ends of the shafts when the traffic increases to such an extent that the drop in the track rails becomes higher than desirable.

Special precautions have been taken to reduce to a minimum the flashing over which is liable to be caused by heavy short circuits on the track. With this object the commutator cones have been covered with projecting fibre sleeves, and all the metal near the commutators has been painted with a composition made up of half gold size and half linseed oil. In addition screens are fixed between the brush-holders to prevent flashing from entering the armature. By these and other means the number of flash-overs was reduced from an average of six per month during the first six months of operation to an average of two per month for succeeding months.

The transformers are mesh connected on the high-tension side, with tappings on the high-tension side to compensate for variations in the supply voltage, and on the low-tension side for starting. The tanks are $\frac{3}{4}$ in. boiler plate, with external tubes to provide increased cooling surface. They are arranged so that when the core has been lifted by the overhead crane it can be set down on a drip tray for examination. The chambers are ventilated by ducts carried up to the roof to Barrol ventilators ; cooling air is drawn from outside the station by motor-driven fans, and passed round the foundations of the converters into the transformer chambers through an expanded-metal opening in the door.

The auxiliary equipment of each sub-station includes a bank of three single-phase transformers, which gives a supply to the motor-generator, air compressor used

Digitized by Google

for cleaning purposes, ventilating fans, and the lighting transformer. The motor-generator gives a direct-current supply at 110 volts for charging the battery used for the tripping and indicating circuits and emergency lighting.

Negative Busbar Pilots.

In Canal sub-station a panel is installed carrying two centre zero voltmeters connected to pilot wires running to the negative busbars of the three sub-stations. A permanent deflection of one of the pointers indicates to the sub-station attendant that there is a difference of potential between the busbars in two adjoining sub-stations, and that one sub-station is "motoring" the other. He can then instruct one of the sub-stations to raise or lower its voltage of supply till it is taking its proper share of the load and the transference of current ceases.

Power and Lighting Equipment.

Two sub-stations are provided in the electrified section to give a supply for general purposes, one situated at the Retiro terminus and the other at the Victoria workshops. The former is designed to deal with the power and lighting requirements of the terminal station, train yard and offices, and to give a supply for pumping and for operating the compressors of the pneumatic signalling system; the latter supplies power and light to the workshops, locomotive sheds, car sheds, and repair shops at Victoria Station. Details of the principal apparatus are set out below.

Retiro sub-station has a frontage on the Paseo de Julio, and the external elevation has been designed to be in keeping with its location; internally the design is similar to that of the traction sub-stations.

Space is reserved in the station for three traction rotary converters which will be installed when the goods traffic in the yard and at the docks is handled electrically. The high-tension switchgear is similar to that in the traction sub-stations; the direct-current board consists of slate panels supported on a pipe framework. Battery charging boosters are mounted on the bedplate of the motor-generators and direct-coupled to the armature shafts. A battery-regulating switch of the single-sided remote-control type is installed to control the end cells of the lighting battery.

The Victoria sub-station (Fig. 15) is a small building containing two banks of transformers, with the necessary high-tension switchgear and low-tension panels. The high-tension switchgear is of the standard type; the low-tension board consists of slate panels mounted on pipe framework with expanded metal screens enclosing the back of each panel. The low-tension feeders are run from the sub-station as overhead lines.

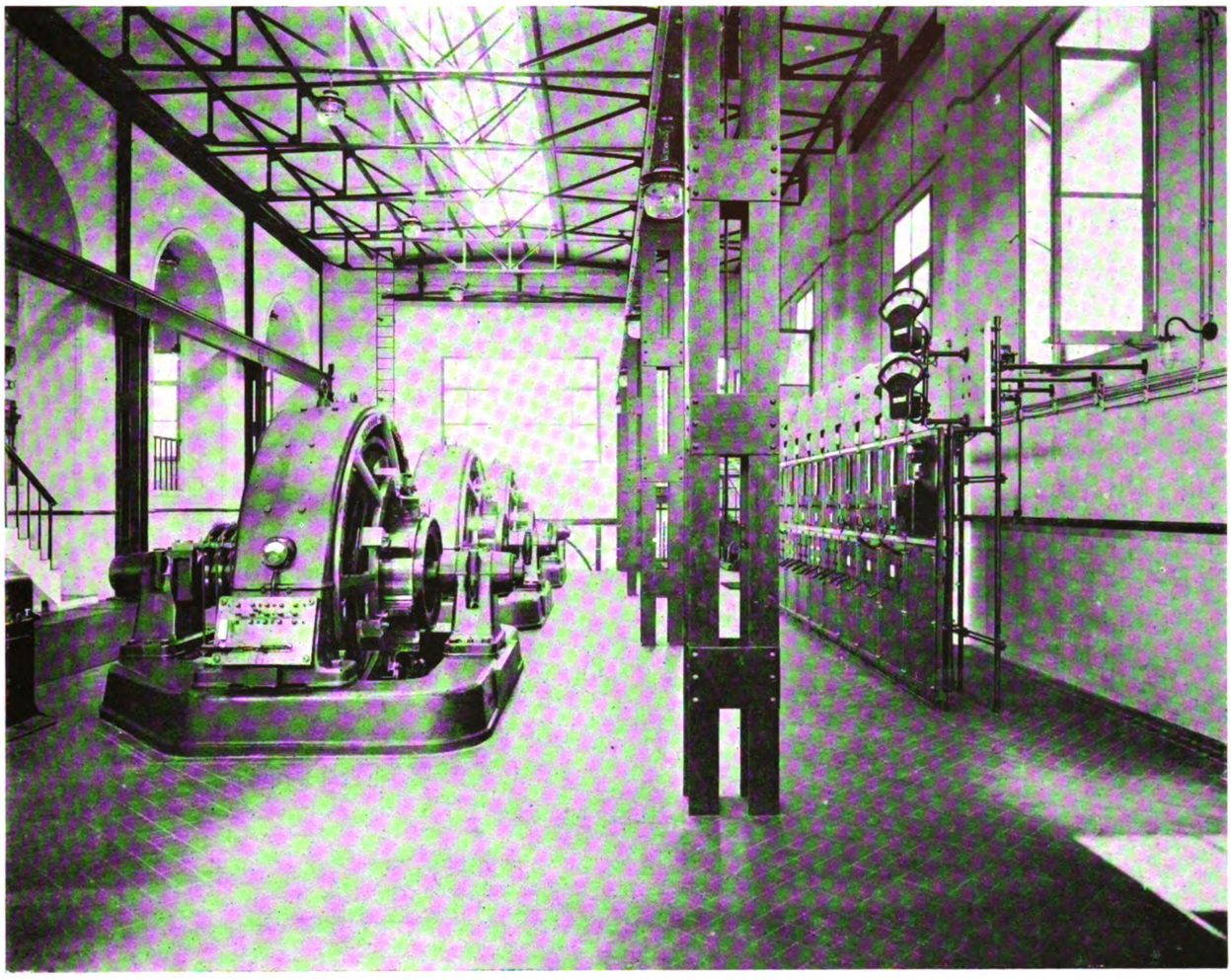


Fig. 14.—Interior of Palermo Sub-station.

The lighting of wayside stations along the electrified track is taken from the third rail, the circuits being arranged to take four 200-volt lamps in series. At Parque and Tigre vulcanised-bitumen-sheathed, paper-insulated cables of ·1 sq. in. section are taken from the third rail and track rails respectively. Elsewhere the lighting wires are taken from the board in the sectioning "casilla," a small brick chamber in which the

Digitized by Google

track sectioning switches are housed. The main lighting panel is of slate, and carries a single-pole knife switch operated by a handle which projects through the panel, a fuse, and a voltmeter. The circuits are controlled by double-pole knifeblade switches, each circuit being protected by a double-pole fuse.

DETAILS OF PLANT IN POWER AND LIGHTING SUB-STATIONS.

Retiro Sub-station.	
Type and output of motor generators	British Thomson-Houston Company's; asynchronous 440-volt motors; output 400 KW. at 240 volts d.c.
Type and capacity of step-down transformers	British Westinghouse Company's; three-phase, oil-immersed, naturally-cooled; 600 KVA. capacity; ratio of transformation 20,000 to 440 volts.
Type and size of secondary battery	Chloride Electrical Storage; 4,000 ampere-hours capacity at 240 volts.
Type of battery-regulating switch	Bertram Thomas.
Victoria Sub-station.	
Type and capacity of transformers ...	British Electric Transformer Company's Berry type; three single-phase transformers; 375 KVA. capacity; ratio of transformation 20,000 to 440 volts.

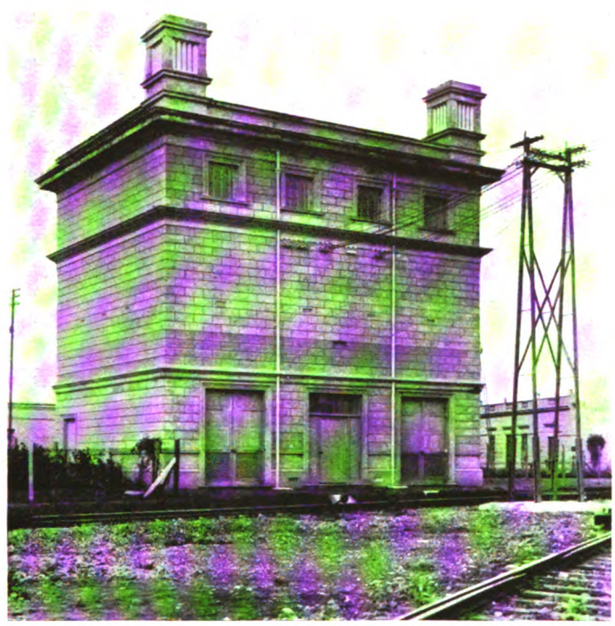


Fig. 15.—Victoria Power and Lighting Sub-station.

ROLLING STOCK.

As the passenger service on the lines to be electrified is frequent and suburban only, the rolling stock equipment was naturally laid out on the multiple-unit system (Fig. 16). The stock ordered was as follows :—

55 motor coaches each equipped with two motors.
12 motor coaches each equipped with four motors.
50 trailer coaches.

All the coaches are of the saloon type, with cross seats (Figs. 17 and 18).

There are two classes of seating accommodation on the suburban trains in Buenos Aires, first and second, but the distribution of passengers between them differs from that obtaining in this country, inasmuch as the ratio of higher to lower class tickets sold is of the order of 1·4 to 1. Consequently a larger proportion of first-class coaches is required, and the numbers ordered for the electric service were :—

First-class.—52 motor, 37 trailer coaches.
Second-class.—15 motor, 13 trailer coaches.

All the coaches equipped with four motors are first-class coaches. These will be used for hauling trains made up of a motor coach at each end, and between them six first-class trailer coaches taken from the old steam stock and equipped only with control wiring to allow of the train being operated from either end by one man. These trains will be used on days of specially heavy traffic, the principal of which is Tigre regatta day, when 9,000 people have been moved by steam trains from Tigre in two hours.

The limiting features in designing the coaches were :—

(a) The high standard of comfort to which suburban passengers in Buenos Aires are accustomed.
(b) The provision of vestibule connections between coaches.
(c) The existence of low platforms necessitating steps up into the coaches.
(d) The provision of a driving compartment at each end of every coach.
(e) The use of vacuum brakes.

As is particularly desirable in a hot climate, the coaches are large and airy, the capacious loading gauge adopted by the broad gauge lines in the Argentine allowing more latitude in this respect there than in this country. The height from floor to centre line of the semi-elliptical ceilings of the saloons is 8 ft. $7\frac{1}{8}$ in., and the width between pillars is 9 ft. $7\frac{1}{2}$ in. Eight 6 in. ventilators are fitted in the roof, and four 38 in. fans are installed in the first-class coaches. The lower side lights slide upwards, and all windows are provided with upper and lower louvred shutters in place of blinds to keep out the sunlight. The shutters are covered with fine mesh copper wire gauze to prevent the entrance of mosquitoes (Fig. 18).

The minimum space which must be provided for each seated passenger is definitely set out in the Government regulations, the requirements being that the distance between seats set *vis-a-vis* shall not be less than $15\frac{3}{4}$ in., and that the length of seat shall be at least $18\frac{3}{8}$ in. and $15\frac{3}{4}$ in. per passenger in first and second-class coaches respectively. Further, the gangway between seats shall be not less than $21\frac{5}{8}$ in. wide.

Besides the provision of two classes of accommodation, the Government regulations call for at least one w.c. compartment on every local train. Space had also to be reserved in a certain number of coaches for compartments for the use of the postal service and for luggage. These requirements were met by providing a w.c. compartment in each first-class motor coach and postal, luggage, and w.c. compartments in the second-class motor and trailer coaches. Before the service started the Government, however, agreed to the removal of the w.c. compartments from the first-class coaches.

The height above rail level of the platforms on the Tigre line varies from about 6 in. to 20 in. The height above rail level of the motor coach floor is 4 ft. 2 in., and the Government regulations call for three intermediate steps. A door is provided at each end of the coach, and also one in the middle. The latter is double, the doorway being five feet wide, and intended to take two persons abreast, the streams being separated by the central door-post. As the doors have to be set back from the side line of the coach, it was not possible to arrange the sills to run beneath the body sides from headstock to headstock, or even between bolsters. In the case of the motor coaches (Fig. 17), the main longitudinals are therefore spaced at a width of 7 ft., and consist of built-up fish-bellied steel girders 2 ft. 6 in. deep in the centre, with holes cut out of the web for lightness and to facilitate access to the electrical

Digitized by Google

Fig. 16.—Multiple Unit 4-Coach Train—Central Argentine Railway.

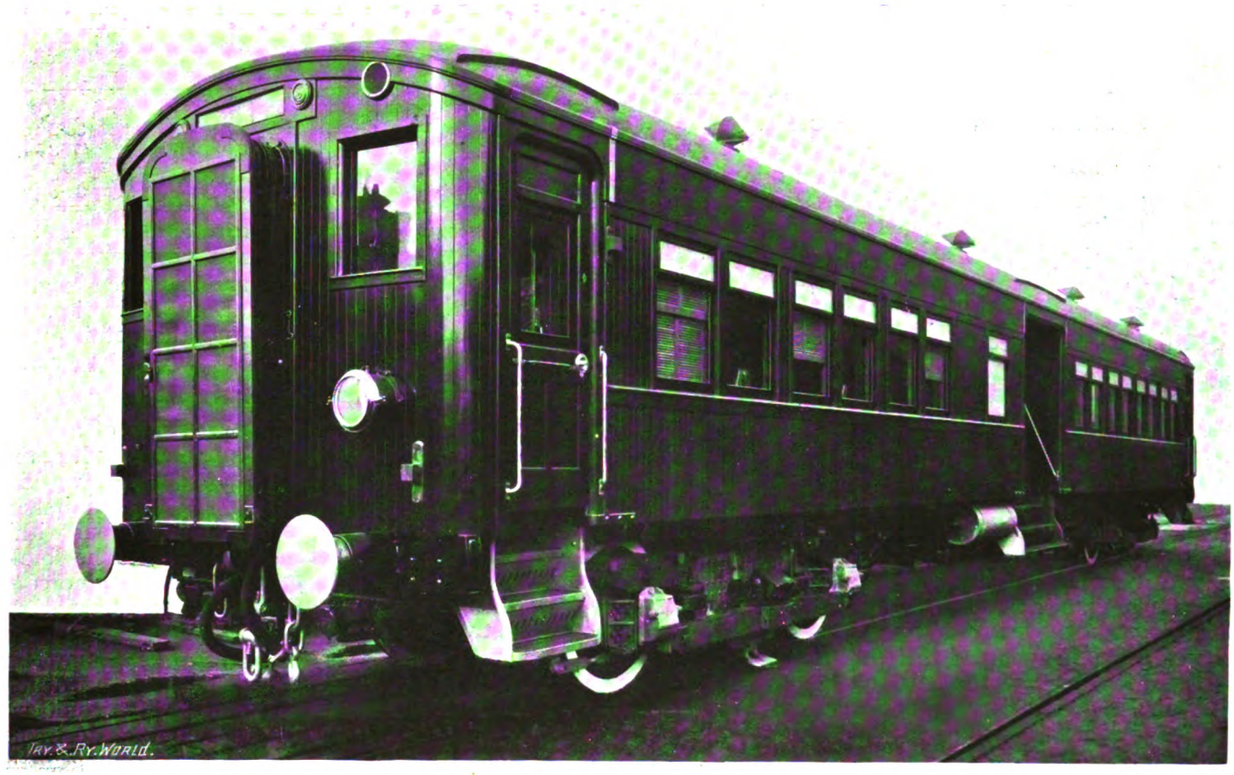


Fig. 17.—Exterior of First Class Coach with Motor Bogies.

Digitized by Google

equipment. These main longitudinals run from headstock to headstock; they support the angle bar sills, which are interrupted to clear the footsteps by means of pressed steel brackets. The main members of the trailer underframes, which are of the Livesey-Gould type, are two 12-in. channels spaced 3 ft. apart, and running from headstock to headstock; they are stiffened with king and queen trusses, and support the body sills by means of transverse cantilevers.

The motor coach floors are of steel plates $\frac{7}{64}$ in. thick stiffened with indentations; the plates are covered with "Induroleum," a non-inflammable composition which was laid at the builder's works, the whole underframe being shipped in one piece with the floor in position. The trailer coach floors are pitch pine in two layers $\frac{3}{4}$ in. thick.

The end vestibules of the coaches are arranged to serve either as entrance ways for passengers or as driving compartments for the motormen. They are 4 ft. wide and contain the driver's brake valve, master controller and hand-brake wheel. As the English rule of the road is observed on the railways in Buenos Aires, and the wayside platforms are not of the "island" type on the Central Argentine Railway's suburban lines, the driving position must be on the left-hand side

Fig. 18.—Interior of First Class Coach.

of the train in order that the motorman may see the guard's signals without leaving his position; accordingly the brake and master controllers are mounted on the near (or left-hand) side of the vestibule; the hand brake, which is normally operated only when entering termini, is reached by walking across the vestibule. Duplicate doors are provided so that when the vestibule is used for passengers the electrical gear is all closed off; when used as a driving compartment the step-well is covered by a $\frac{3}{16}$ in. thick chequered fall-plate hinged to the door closing the opening in the side of the coach. A removable circular seat of the "music stool" type is carried by the fall-plate, the end of the leg being placed in a hole in the plate.

In the motor coaches the vestibule also contains the panels carrying the switches for auxiliaries, e.g., lighting, control circuits, brake circuits, relays, &c., and also sundry tools, viz., short circuiting bar, hammer, pliers, rubber gloves, &c.

The concealed framing of the coaches is pitch pine: all exposed framing and the finish of the outside and of the vestibules are of teak. The interior finish of the first-class coaches is light wainscot oak and of the second-class coaches pitch pine. The ceiling sheets are white millboard on red deal matchboarding. The reversible seats in the first-class coaches are upholstered in leather; the fixed seats in the second-class coaches are framed with pitch pine slats. The roof sticks are ash or elm with ten carlines of 3 in. by 2 in. angle bar, and the roof boarding is red deal covered with canvas. The sides and ceilings were shipped in two sections; the ends of the coaches and the partitions were shipped whole, all being packed in zinc-lined cases.

The coaches were lighted by three two-light fittings, with Holophane glass globes down the centre of the ceiling, and eight pendants down the sides of each saloon. A single light pendant is fixed above each entrance and a headlight, two signal lights, and an illuminated destination indicator are provided on each end of each coach.

Details of the rolling stock follow:—

DETAILS OF ROLLING STOCK—GAUGE OF RAILS, 5 FT. 6 IN.

COACHES.	MOTOR COACH.	TRAILER COACH.
Length over buffers	65 ft. 3 in.	65 ft. 3 in.
Length over headstocks	61 ft. 11 in.	61 ft. 11 in.
Length over body	63 ft. 3 in.	63 ft. 3 in.
External width of body	10 ft. 3½ in.	10 ft. 4¼ in.
Height from rail to centre of buffer	3 ft. 5 in.	3 ft. 5 in.
Height from rail to top of roof ...	13 ft. 2¾ in.	13 ft. 2¼ in.
Height from rail to floor	4 ft. 2⅛ in.	4 ft. 1⅛ in.
Height from floor to ceiling ...	8 ft. 7⅞ in.	8 ft. 7⅛ in.
Distance between centres of bogies	40 ft. 0 in.	40 ft. 9 in.
No. of first class passengers seated	72	68
Do. second class	66	63

BOGIES.	MOTOR BOGIE	TRAILER BOGIE.	
Wheelbase of bogie	9 ft. 0 in.	8 ft. 6 in.	8 ft. 6 in.
Diameter of wheels	3 ft. 6 in.	3 ft. 3 in.	3 ft. 3 in.
Diameter of axle at centre ...	7 in.	5¾ in.	5⅝ in.
Size of journal...	10 × 3½ in.	9½ × 4½ in.	8 × 4½ in.
Distance between-centres of journals	7 ft. 6 in.	7 ft. 3 in.	7 ft. 3 in.
Width over side frames ...	6 ft. 10½ in.	6 ft. 9 in.	6 ft. 9 in.
Length over headstocks ...	14 ft. 8 in.	13 ft. 9 in.	13 ft. 9 in.

WEIGHT OF ROLLING STOCK (EMPTY).	2-Motor Coaches.	4-Motor Coaches.	Trailer.
Coach body, underframe, and bogies	39·0 tons	40·5 tons	33·2 tons
Electrical equipment	11·5 ,,	20·5 ,,	1·3 ,,
Total weight	50·5 ,,	61·0 ,,	34·5 ,,
Weight per passenger seat ...	0·74 ton	0·84 ton	0·58 ton

The design of the trailer cars has been slightly modified in the case of subsequent deliveries, the spacing of the body partitions and the detail of the bogie being made similar to those of the motor coaches.

BRAKE EQUIPMENT.

The service duty required the provision of a pump for each two-motor equipment capable of exhausting 50 cubic feet of free air per minute; under working conditions of joint and valve leakage this equipment produces a 20 in. vacuum in the train system within 22 seconds after complete destruction. The brake equipment is laid out to provide a braking force of 105 per cent. and 95 per cent. of the tare weight of the motor and trailer coaches respectively. The two brake cylinders on each motor coach are 24 in. in diameter, and the capacity of each is augmented by a vacuum reservoir. In the four-motor coaches space could not be reserved for the reservoirs beneath the underframe, so they were slung between the roof and ceiling in the centre vestibule. The operating gear consists of a

Digitized by Google

partial rapid-acting valve, an emergency valve, and the driver's brake valve and controller. A Simplex gauge shows the pressure in the train pipe and a vacuum horn is connected to the system to take the place of the whistle or bell used for signalling purposes on steam lines.

Motor Bogies.

A view of the motor bogie is given in Fig. 19. The side frames are built up of $\frac{5}{8}$ in. plate reinforced at the top by angles and at the bottom between wheel centres by channels. The headstocks are 10 in. bulb angles and the central cross member consists of two channels, 15 in. deep, superposed on two 6 in. channels, the latter forming a step or ledge $4\frac{1}{2}$ in. wide beneath the suspension springs of the motors. Diagonal stiffness is ensured by the insertion of upper, lower and intermediate sets of horizontal gusset plates riveted to the central cross member and to the channel and angle-bar stiffeners of the side frames. The connection of the headstocks to the side frames is made through corner gussets and wrappers. The bolster is built of two 10 in. channels with top and bottom cover plates $\frac{7}{16}$ in. thick. The bolster springs are of helical form with inner and outer coils 12 in. diameter outside. The centre pivots and side bearings are of cast steel. The horns of the side frames are reinforced with plates $\frac{7}{8}$ in. thick, applied externally. The horn blocks are of cast steel and are fitted with gun-metal wearing strips extending over the face and edges. The axle boxes are of cast steel, fitted with gun-metal bearings lined with white metal and with malleable iron centre-bearing keys. Each box is cast with a wing bracket at one side to take the end of the collector shoe beam. The bearing springs are of the laminated type with solid

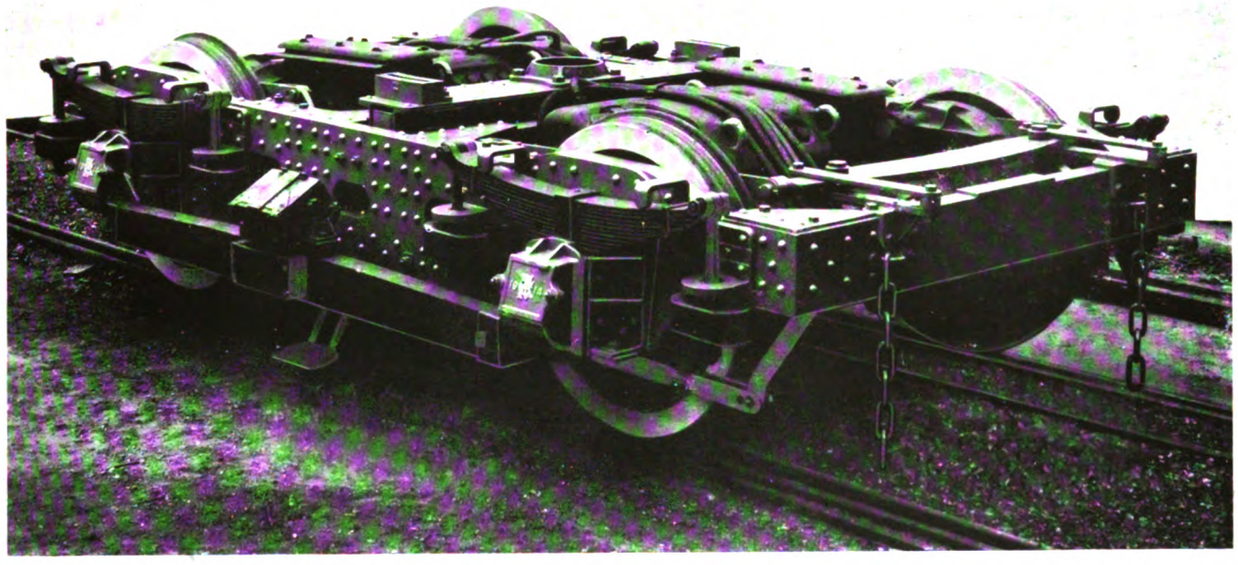


Fig. 19.—View of Motor Bogie Carrying Two Motors.

eyes; the hangers are fitted with auxiliary india-rubber springs of the oval concentric type.

The brake heads are of cast steel, each fitted with a cast-iron shoe which is secured in place by a tapered key of the standard form, with the addition of a tail piece extended downwards so as to be readily accessible from the car shed pits.

The arrangement of the brake rigging ensures uniform force being exerted on all blocks with pressures evenly distributed without any tendency to cross-bind or produce torsional stresses in the levers. The leverage of this rigging is 8 to 1. In order to provide automatic compensation for wear of the brake blocks, three sets of six coaches each were fitted with three different types of slack adjuster—the Monarch, Hills', and the nut and ratchet type. The latter consists of a tubular nut fitted in the main pull rod and rotated by a pawl and ratchet; the box which carries the pawl is formed with a segment of a toothed mitre wheel, which gears with a similar portion carried on a vertical stud attached to the crosshead at the end of the pull rod. The periphery of the second mitre wheel is anchored to the underframe by means of pitch chains which thus cause it to rotate in response to the travel of the pull rod. The range of the gear is sufficient to allow the brake piston to make a full stroke when operating through a badly adjusted brake rigging, and thus to gather the slack till the normal condition is reached. When the brake is released the pawl will cause a partial rotation of the nut whenever the working stroke is sufficient to turn the mitre gears through an angle of 60 deg.

The collector gear consists of an under-running shoe (Figs. 20 and 25), which makes contact with the under surface of a channel-shaped conductor rail. The shoe casting is carried on an oak beam fixed to lugs on the axle-boxes. The collecting skate has two motions:—

(*a*) An up-and-down movement to follow the level of the conductor rail: this is controlled by helical springs on a horizontal axle passing through the block to which the skate is bolted.

(*b*) A sideways movement to allow for the end play of the axle-boxes and want of alignment of the rail; this is controlled by leaf springs bearing on the suspension links of the skate.

The difference in the heights of the top of the skate in its extreme positions is $2\frac{1}{2}$ in.; its horizontal movement is 3 in. The average upward pressure of the skate is 28 lb. The shoe body and suspension links (Fig. 20) are cast steel, machined to gauge; the skate is cast iron and is designed to break when it strikes an obstacle. If desired the skate can be locked down in such a position that it clears the conductor rail altogether, thus enabling the equipment of a coach to be isolated. Skates run about 130,000 miles before becoming worn out.

Digitized by Google

Electrical Equipment of Trains.

The average distance between stations on the Tigre (Victoria) route is 1⅓ miles; the present timing of electric trains which stop at all intermediate stations is 47 minutes, giving a scheduled speed of 22½ miles per hour. This can be increased to 25 miles per hour when desired without overloading the equipment. As the average length of run is comparatively great and as there are no severe gradients on the line, it was not necessary to utilise the whole of the weight of the motor coaches for adhesion by gearing a motor to each axle. Consequently a two-motor equipment was adopted, each motor dealing with a load of about 45 tons. With the width between wheels available on the broad gauge (5 ft. 6 in.) it was possible to design a motor (Fig. 21) of ample capacity without interfering with the normal proportions of its various parts. In addition to the stopping service the trains are also required to make express or semi-express runs, stopping only at one or two intermediate stations and performing the journey at a scheduled speed of 37½ miles per hour. This condition is provided for by reducing the excitation of the main fields by 50 per cent. in one step. Details of the electrical equipment of the coaches are given below :—

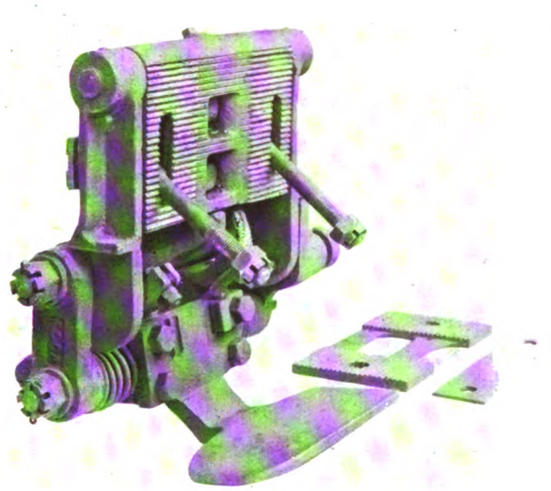


Fig. 20.—Collector Shoe and Suspension Links.

Details of Electrical Equipment of Rolling Stock

Type of motor	G.E. 235.
H.P. of motor	250 H.P. on one hour rating (75° C. rise).
Voltage across motor	800.
Overall length of motor	5 ft. 0¾ in.
Diameter of armature	20 in.
Core length	17½ in.
Diameter of commutator ...	17¾ in.
Length of commutator	7⅞ in.
Weight of motor, including gears and gear case	8,430 lb.
Armature bearing (pinion end) ...	5 in. × 11¾ in.
,, ,, (commutator end)	4½ in. × 8⅞ in.
Gearing—pinion	22 teeth; 2¼ in. diametral pitch; forged steel; oil tempered.
,, gear wheel	70 teeth; width of face 5¼ in. Cast-steel hub with oil tempered forged steel rim shrunk on.
Wheel diameter	3 ft. 6 in.

The two motors (Fig. 19) mounted on each motor bogie are arranged for nose suspension from the bogie transom, the suspension nose being cushioned by springs against both upward and downward movement; they drive the axles through single pinions and gears with a gear reduction of 70:22. The clearance between the lowest point of the cast-iron gear case and rail level is 4½ in. The suspension bearings on the axle are fitted with gun-metal linings, the length of axle between bearings being protected by a housing to exclude dust. The armature bearings are gun-metal lined with white metal. Both sets of bearings are lubricated with oil and waste.

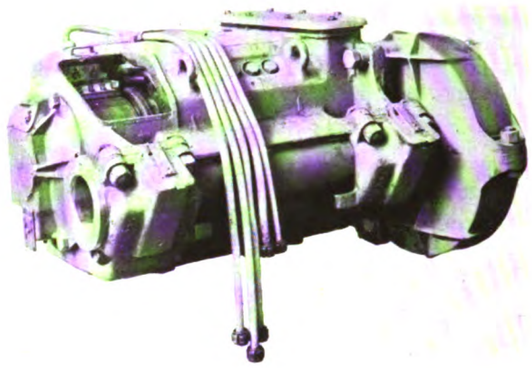


Fig. 21.—The Motor.

The motor carcase is a single steel casting, with machined seats for the four main and four commutating poles. Provision for ventilation is made in the form of a rectangular opening of 160 sq. in. at the pinion end, arranged to take a flexible duct communicating with the interior of the coach, through which the air can be drawn if it is found that there is too much dust in the air taken direct from beneath the coach. The air entering this opening passes to the commutator end between the fields and over the surface of the armature; it then returns through ducts in the core and is expelled through openings in the upper part of the end shield by a fan fixed on the armature shaft. All other openings in the carcase are fitted with watertight covers.

The armature core stampings are mounted direct on the shaft and can be kept solidly together when being pressed off by bolts passed through some of the ventilation ducts. The armature coils are made up of flat strips, insulated from each other with mica, bound together with tape, and insulated from the core with pressed mica. The field coils are copper strip, the main coils being wound on the flat and the commutating coils on edge. The two brush holders each carry four carbon brushes, the pressure on which is adjusted to 4½ lb. Each holder is carried off two porcelain insulators, the stud insulation being mica.

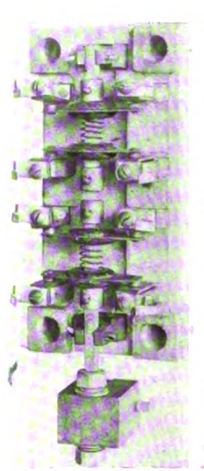


Fig. 22.—Contactor Interlocks.

The motors are built and insulated for a working pressure of 800 volts and the control system provides for operating with two motors in series, and in parallel with tapped field. The control at starting is automatic, the rate of cutting out series resistance being determined by a "notching" relay, which allows the contactors to close in the proper order as the main current falls to a predetermined value. The main contactors are wound

Digitized by Google

to operate with any line voltage from 480 to 850. They are 15 in number and are mounted in a sheet steel box with the front covers hinged to swing open for inspection. The interlocks (Fig. 22) which made the combinations required for the successive control steps are mounted on spindles at the back of and are operated by the contactor arms. The main resistances are cast-iron grids insulated with mica and mounted in frames carried from the underframe members by insulated bolts and bobbins. The main circuit breaker, which can be set or tripped from the driver's cab, and the reversers are mounted in watertight sheet steel boxes. All cables beneath the coaches are carried in solid drawn steel conduit, screwed into the cases containing the apparatus; where breaks are required in the cable junction boxes are provided. The conduit was erected in this country and shipped in position on the underframe, the cables being pulled in during the re-erection of the coaches in Buenos Aires.

The leads, which run from end to end of the train, are three in number:—

(*a*) The train line, a single-core cable.
(*b*) The pump line, a twin-core cable, one core being the full speed and the other the half-speed lead for the pump motor.
(*c*) The control line, a bundle of seven cables coupling up controllers, circuit breakers, etc.

These leads bifurcate at the end of each coach and terminate in sockets attached to the headstock. Connection between coaches is made by removable jumpers and plugs.

The vacuum pump and motor are mounted in a framework slung to the underframe. The pump is a single-acting two-cylinder machine coupled to the motor through a helical spring coupling. It is geared down 4 : 1 by a chain inside the pump casing. The motor is of 3½ H.P. capacity, series wound. A series resistance, which can be short-circuited, permits it to be run at two speeds, one approximately double the other. Normally the motor is run at half speed to maintain the vacuum against leaks and the use of the vacuum horn; when the driver's brake-handle is put into the "release" position, the brake controller cuts out the resistance and the motor runs at full speed till the required vacuum is obtained, whereupon the brake handle is put to the "running" position, thus inserting the resistance again into the circuit. There are four positions of the driver's brake handle:—

1. Neutral position	...	Motor stopped; train and pump pipes not connected together.
2. Release position	...	Motor running full speed; train and pump pipes connected through full gate in driver's valve.
3. Running position	...	Motor running half speed; train and pump pipes connected through half gate in driver's valve.
4. Application position	...	Motor running half speed; train pipe full open to atmosphere; pump pipe blanked off.

The "dead man" device on the controller consists of a pilot valve operated by a knob on the main handle. When the knob is released this valve admits air to the emergency valve, which is thus actuated, and opens the train pipe to atmosphere, blanking off the pump pipe.

Car Sheds.

For the reception of the electric rolling stock the company built a new car shed at Victoria. This shed (Fig. 23) is 230 yards long and contains 10 tracks. The rails are raised from the floor on longitudinal concrete supports, so that the equipment underneath the coaches is easily got at. Power for moving the coaches in the shed is supplied from overhead trolley wires carrying little carriages from which hang cables that can be plugged into the train line sockets on the coaches. An existing shed was adapted as a repair shop by raising the roof and installing 20-ton travelling cranes.

The routine maintenance of the stock consists of a nightly inspection and a shed day once a fortnight. It is intended to give a heavy overhaul when cars come in for wheel turning, which will be for the motor coaches after running 60,000 to 80,000 miles, and for the trailer coaches after 100,000 miles. The shed and repair shop staff consists of two shifts each of 31 men,

Fig. 23.—Interior of Victoria Car Shed.

with seven other men employed in the shops during the day only, and three rolling stock examiners who are stationed at Retiro.

Electrical Equipment of Track.

The electrical equipment of the track, the details of which are stated below, comprised the bonding of the track rails, the erection, bonding, and protection of the conductor rails, the laying of interconnecting cables across gaps in the conductor rail, and the provision of switchgear for dividing up the track into short electrical sections.

Details of Electrical Equipment of Track.

Conductor Rail.		
Make	...	North Eastern Steel Company's high conductivity steel.
Weight per yard	...	86 lb.
Length of rail	...	33 ft.
Composition	...	Carbon 0·03 per cent. Silicon, nil. Sulphur, 0·05 per cent. Phosphorus, 0·06 per cent. Manganese, 0·36 per cent.
Electrical resistance	...	6·7 times that of copper of equal volume.
Ramps	...	Shaw's cast steel.
Insulators.		
Type	...	Doulton's single shed round porcelain.
Caps and clips	...	Malleable cast iron.
Bonds.		
Type	...	British Insulated and Helsby Cables Company's solid head and pin types.
Track bonds	...	Ribbon type, 13½ in. long, ·166 sq. in. area.
Conductor rail bonds	...	Ribbon type, 6⅞ in. long, ·166 sq. in. area.
Cross bonds	...	19/·106 in. stranded, 24 in., 82 in. and 123 in. long, ·166 sq. in. area.
Cable terminal bonds	...	169/·0435 in. stranded, 18 in. long, ·25 sq. in. area.
Bond tester	...	Evershed and Vignoles type.
Anchorages.		
"A" type	...	British Insulated and Helsby Cables Company's composition insulators, with shackles, plates, and clamps.
Sectioning Gear	...	British Thomson-Houston Company's 800-volt remote operated type.

Digitized by Google

Sundry Works.

In connection with the electrification scheme, a number of works were carried out which represent important betterments of the track. Thus the whole of the route has been fenced with wire netting. On a length of about a mile near Tigre which was frequently flooded, the track has been raised above flood level. There are 75 level crossings on the route, and in order to prevent people and animals from straying on the

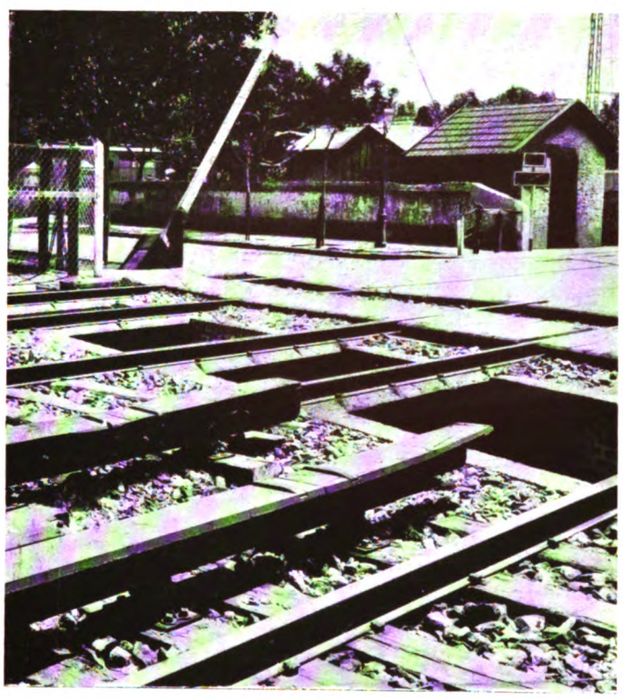


Fig. 24.—A Level Crossing with Cattle Guard.

line at these places special "cattle guards" were installed. A cattle guard (Fig. 24) consists of a trench dug across the tracks parallel to the road with brick retaining walls and concrete invert. The depth varies, the standard being about 7 ft.; the width is 6 ft. 6 in. The track rails are carried across on wooden beams, having the upper corners chamfered off to reduce the foothold. The fences are carried up to the trench, and a footway with a locked gate is provided for the use of the maintanance gangs.

Other incidental improvements were the provision under every rail of four sleepers of extra length to carry the insulators, and the installation of new track fishplates.

Track Bonding.

The track rails are used throughout for the return circuit of the traction current; they weigh 85 lb. per yard, and are partly 40 and partly 33 feet long. The joints were bonded with two copper bonds of the ribbon type with solid heads, giving a total cross section of $\frac{1}{3}$ sq. in. of copper, and making the ratio of conductivities of six feet of rail, including and excluding a bonded joint, about 3 to 5. To reduce the risk of loss by theft the bonds are fixed under the fishplates. This involved the provision of new fishplates with sufficient clearance for the bond between the plate and the web of the rail. The bond holes were drilled with ratchet drills without interfering with traffic, and the bonds were fixed by hand-operated screw compressors. A few pin type stranded bonds were used at special work of manganese steel, the bond holes being drilled at the maker's works and painted with spirit varnish to prevent rusting. The two rails of each track are cross-connected every 100 yards with stranded copper bonds carried in wooden troughs fixed to the sleepers. Adjacent tracks are cross-bonded every 100 yards.

In the Retiro terminus the rails are used for track circuiting with alternating current. To permit of using the same rails as a path for the traction current impedance bonds are placed at the ends of the track-circuiting sections, these bonds consisting of heavy choke coils contained in oil-filled cast-iron cases which are placed between the sleepers. Where crossings occur only one rail of each track is used for the traction current.

The routine maintenance of the bonding consists of the removal of the fishplates and an examination for broken strands. This work is organised to extend over twelve months. In addition, resistance measurements of the joints are taken every six months by means of an Evershed and Vignoles bond tester.

The Conductor Rail.

Trespassing on the railway tracks is much more prevalent in the Argentine than in this country, so any form of conductor rail adopted must be particularly well protected from the risk of people touching it. It was felt that the common form of flat-bottomed rail with side boards attached to it was too exposed on the top to be safely used, and it was not possible to provide top cover or adopt the American type of under-running rail on account of the limited space available between the structure and load gauges. The form of rail shown in Fig. 25 was ultimately selected as occupying the minimum space consistent with proper clearance, and as permitting of a very complete insulating covering. The rail was rolled without difficulty in high-conducting steel, and can be handled without any tendency to distortion. To save space in shipping, two rails were nested together, oak distance pieces being put between them and bolts being passed through the fishbolt holes. Before leaving the works the rails were dipped hot in bitumastic solution to prevent rusting; when the service started up a special skate

Fig. 26.—Conductor Rail Ramp.

with scraping edges was fixed to the collector shoe gear on a coach which was hauled up and down by a steam locomotive till the contact surface of the rail was clean; hand scrapers were also used.

The fishplates are single, and applied to the back of the rail, the boltheads being countersunk in the head to leave a free passage for the toe of the skate. Two bonds with solid plug heads are fixed under the fish-

Digitized by Google

plate, giving a cross section of ·33 sq. in. of copper at each joint. Where gaps occur the rails finish off with cast-steel ramps 5 ft. long, shaped to guide the skate into position without jarring (Fig. 26).

The rails and ramps are covered with a protection of creosoted wood boards built up in the shops and fixed in position on the ground by hammering over the ends of steel strips to embrace the edges of the top table and foot of the rail. The protection has proved very efficient, no case of fatal injury from shock having occurred up to date, though barefooted boys have been seen to run about over the rail and men have used it as a barrow plank.

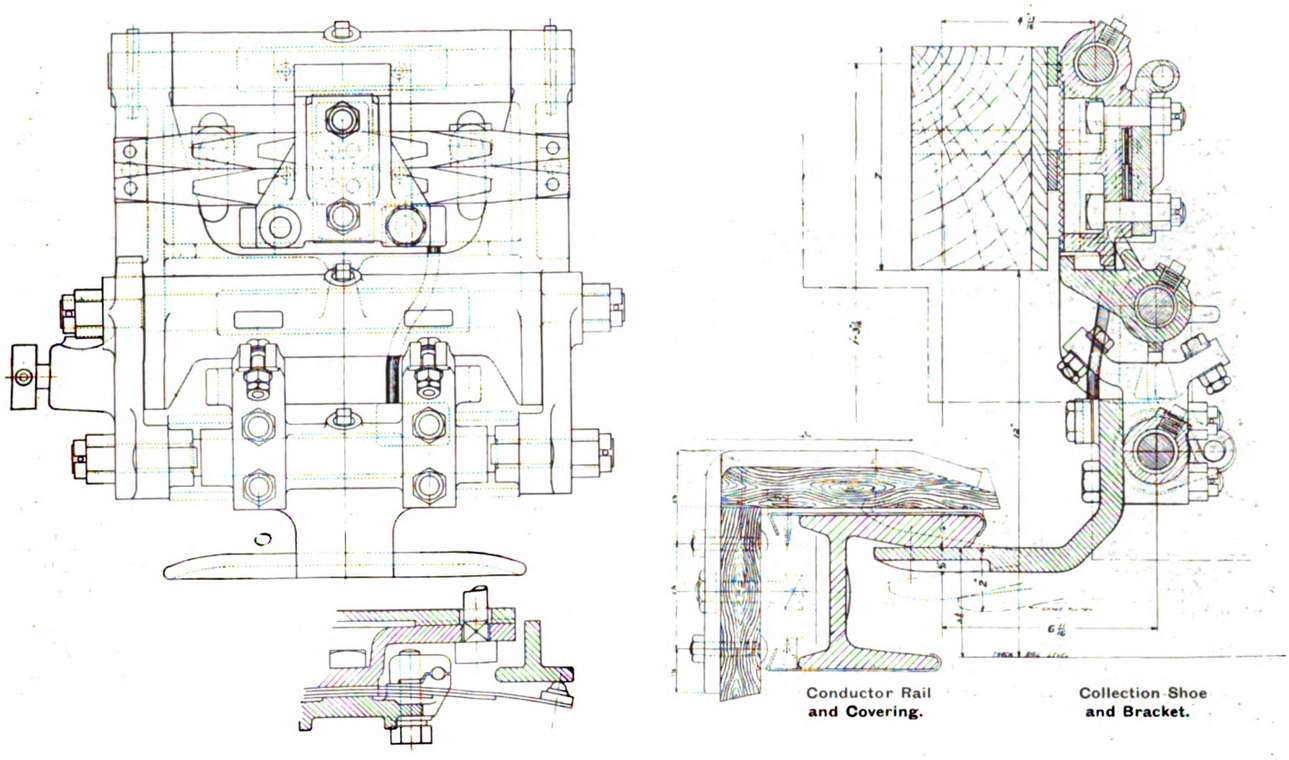


Fig. 25.—Collecting Shoe and Conductor Rail with Protecting Covering.

The rail is carried on malleable iron castings cemented into porcelain insulators which stand on the ends of specially long sleepers, and are fixed to them by malleable iron clips. The sleepers are of Argentine hardwoods, which are very difficult to drill and cut. They are not finished very square, and in order to provide a flat soft bearing, and to allow for the running rail sinking into the sleepers, packing pieces are placed below the insulators consisting of creosoted pine boards ½ in. and ¼ in. thick. The insulation of the rail is very good, the usual weekly figure for leakage from the 50 miles erected being between 1·0 and 1·5 amperes.

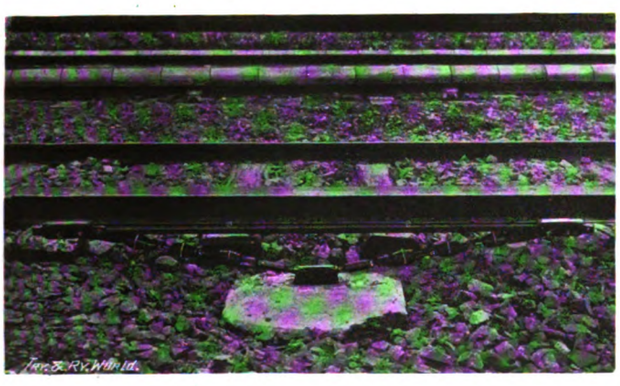


Fig. 27.—Conductor Rail Anchor.

To prevent creepage, every length of conductor rail is anchored (Fig. 27), and no length exceeds half a mile. The anchors are of three types:—

(*a*) Insulated links attached to a plate either fixed in a block of concrete or fastened down to a sleeper; these are used on long lengths of rail. (Fig. 27.)

(*b*) Clips on the foot of the rail which bear against the cap of a special insulator; these are used on lengths of rail up to 700 yards.

(*c*) Clips on the rail which engage the lug on a standard insulator; these are used for anchoring one or two rail lengths.

Where the rail is cut to leave room for expansion (say ¼ mile from an anchor) a short length of rail is mounted behind the gap and bonded to the main rails with stranded bonds.

Track Cables.

When a conductor rail continuity cable crosses under the track it is carried in a cast-iron trough bolted to an old sleeper. At cattle guards the cables are carried in iron troughs supported by old rails.

All positive cables finish in terminal pillars consisting of cast-iron bends into which a fibre sleeve is slipped, the cable being threaded through and the core being sweated into a gun-metal cap resting on a porcelain insulator fitted into the top of the bend. The cap has bolted to it a terminal plate with sockets for stranded bonds which make connection with the conductor rail. The cap and terminal are surrounded by a potware cover which prevents a person walking past from coming accidentally in contact with live metal.

Track Sectioning.

The conductor rail is so divided into sections by switches mounted in signal cabins that the signalman can quickly isolate any faulty section, leaving the rest

Digitized by Google

of the system unaffected. The sections are also so arranged that in case of, say, a derailment at one place any route which would be available for self-propelled trains is also available for the electric trains. Provision is made for paralleling the "up" and "down" conductor rails in order to make full use of their combined conductivity. A view of a cabin sectioning board is shown in Fig. 28. The sectioning switches are normally of the 1,000-ampere quick-break knife type; inter-connecting switches and those feeding the tracks in Retiro terminus are automatic circuit breakers. Emergency switches are provided at the crossovers

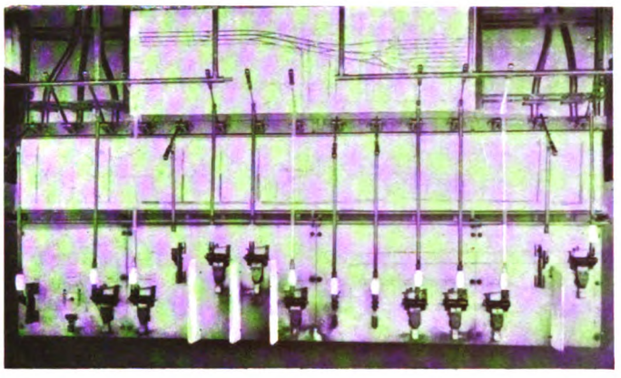


Fig. 28.—Sectioning Board in Signal Cabin.

at wayside stations to allow of trains discharging passengers and setting back to the other line when a fault occurs beyond the platform in a section containing several stations. Sidings and the platform lines at Retiro are controlled by switches mounted in cast-iron boxes, with a danger signal showing when the switch is closed.

Track Maintenance.

A complete outfit of insulated tools is provided to permit the maintenance gangs to change insulators and pack sleepers without having to make the conductor rail dead. The list includes:—

Rubber gloves.
Rubber mats.
Augers insulated with rubber tube.
Spanners insulated with rubber tube.
Spades insulated with rubber tube.
Wooden covers to go over the conductor rails, when the protection is removed.
Earthing bar for connecting the third rail to the track rail.

The electrical equipment of the track is maintained by seven gangs of five men each; one of these men is charge-hand, and another is an examiner who goes over his section every day and reports matters requiring attention.

Operation.

In the first twelve months the mileages run were:—Motor coach miles, 1,782,000 and trailer coach miles, 1,353,000.

The total number of times the supply to the conductor rail was interrupted was:—Under one minute, 66; over one minute, 42.

The total number of trains run was 41,706, and the total amount by which all trains were late arriving at the termini was 817 minutes. The percentage of trains arriving late was 0·213 per cent., of which 0·129 per cent. were over five minutes late. These figures include delays caused by late running of other trains.

As may be judged from these figures, the initial difficulties and maintenance troubles have been few and of minor importance, and the whole system is giving results commensurate with the care devoted to the design, manufacture, and erection of the plant.

SOME TRAMWAY REPAIR TROUBLES.

By G. Basil Barham and G. W. Stubbings.

The demands of the army have caused serious depletion of the repair staffs of many tramway undertakings. This state of affairs, serious in itself, is not assisted by the fact that in these undertakings many of the best and the more intelligent of the drivers have been withdrawn for military service. The loss of these men and their replacement by men of little previous experience and, frequently, inferior intelligence, has not tended to minimise trouble and break down. In these circumstances only the more serious troubles receive thorough attention at once, and unless a car is quite useless, attempts are usually made to effect a temporary repair that will enable the car to remain in service for at least the rest of the day. Many men now having charge of the repair department of tramway undertakings are quite new to the work and are unaccustomed to the faults and many causes of break down of car equipments. There are also not a few engineers whose training has been received in stations dealing with a lighting and power load only who now are responsible for the engineering side of tramway undertakings, and consequently have to advise upon, and often to supervise, repair work. Although continuity of service with a tramway system is not as essential, nor failure as serious, as with a lighting system, it is nevertheless of great importance. Moreover, the possibility of break down of cars, exposed as they are to the severest weather conditions and careless handling, is enormously greater than in the case of central station machinery. It is therefore hoped that these notes will be of service to those in charge of tramway repair work.

Insulation tests are always worth the time spent upon them. If periodically carried out, many an incipient fault will be detected and can be repaired there and then. The most convenient instrument for insulation tests is a direct reading set, such as the Megger, but if such a set is not available, useful results can be obtained with an ordinary voltmeter taking current either from the lighting or the traction systems. Regular maintenance work will also go far to eliminate the possibility of break down. For this reason the cleaning and blowing out of armature tunnels and brush parts, and the careful examination of all contacts that can become loose in normal working should be regular and as frequent as is found possible.

Economy in the shape of poor quality accessories, such as brushes, grease, and oil, will be a disastrous policy. The saving in money will be comparatively small, while the possibility of trouble will be very much increased. These materials should be of the highest grade possible.

The usual result of an earth on an armature is to cause the circuit breaker to blow after replacement. With series parallel control this, however, is not immediately the case. For instance, if the earth is on the motor that electrically is nearest to the rail, the effect of the earth will be to short circuit this motor whilst the controller is on the series notches. When, however, the handle is moved to the parallel position, the circuit breaker or fuse will blow immediately. If the earth is on the nearest motor armature to the line, the effect of such earth will be to short circuit both motors. When the controller is put on the first series notch, there will accordingly be no tendency of the car to start, and as the handle is moved to the second or third position the current will build up sufficiently to open the circuit breaker. The effect of faults to earth on the field coils are varied. If the fault is on the last coils of the nearer motor to the line, the car may start

Digitized by Google

off in the series position, notwithstanding the second motor is short circuited. In the parallel position both motors will work. If the earth be on the first coils of this motor, a weakening of the field will result and, although there may be a feeble tendency to start, the weak field will cause a sufficient rush of current to open the circuit breaker. An earth on the last field coils of the motor furthest from the line will cause this motor to spark badly on the parallel notches, although the car will probably start. A fault on the first field coils of this motor will not prevent the car starting on the series notches, but the circuit breaker will blow immediately the parallel position is reached.

A few words may be said concerning the necessity of periodically overhauling the circuit breakers on cars. These circuit breakers fulfil a very important function, and if they are defective will cause the feeder breaker at the power station to open for a bad car fault with the result that a section is temporarily dead. Cases have been known in which an incompetent driver has failed to notice anything wrong with his car, notwithstanding the feeder breaker has opened some four or five times. Not only has this fault to be localised by the linesmen, but the damage done to the motor or wiring by the excessive currents is most serious. Circuit breakers on cars should therefore have systematic attention, and in view of the severity of the conditions under which they work no breaker should remain in service more than two years without a thorough overhaul. Many breakers in use have a toggle mechanism by which a laminated brush is pressed firmly against the contacts, the handle being locked by taking the toggle slightly over its dead centre. If the adjustment of the stop for the on position be altered by wear or hammering, a very large difference in the tripping current of the breaker will result. For this reason all circuit breakers of this type should be fitted with an adjustable stop, and they should be calibrated for tripping current. Most power-stations containing a battery are furnished with a milking booster, and such booster will give just sufficient current for the testing and calibration of the usual types of car circuit breaker.

The brush gear is a frequent source of trouble, especially if of inferior design and fitted with defective springs. Inferior brushes will not only wear unduly, but will frequently give out grease when warm, with the result that they become sticky in the brush holder. This not only gives rise to sparking, but the consequent over-heating may cause the tension spring to break. Good brushes and well-designed holders will save trouble.

Trouble will also be caused by an accumulation of carbon dust and oil at the bearing end of the commutator. This mixture has a relatively high electrical conductivity and will soon cause arcing to shaft and frame. Cleanliness will be a complete cure for this trouble. Dirt and grease will often cause a flash over at high speeds with some traction motors, and the only remedy is to keep the commutator as clean as possible.

Sparking is sometimes caused by a weakening of the field due to layers of the coils becoming short circuited. This fault is difficult to detect, the only sure test being an approximate determination of the ohmic resistance. Occasionally a magnet coil will be wrongly connected in the stop, so that it acts in opposition to the general magnetic flow. This will give rise to excessive sparking.

New brushes require to be fitted with care as, unless the bedding is accurate, chattering will result with consequent increased wear and sparking. High mica is another frequent cause of sparking, the root of this trouble appearing to be the hardness of the mica. This trouble can be cured temporarily by scouring the surface of the commutator with sand paper applied on a wooden block shaped to the proper curve. The better and the permanent way of dealing with high mica is to undercut it about $\frac{1}{32}$ in. below the surface of the phosphor bronze. The cuts should not be too deep or trouble will be caused by armature coils being short circuited by the cuts becoming filled with oily carbon dust.

Blackening or pitting of certain commutator bars whilst the remainder of the commutator remains in comparatively good condition usually denotes either an open circuit or a high resistance contact in the armature. Motors which run very hot are likely to have the connection of the armature coil to the commutator bar unsweated ; or, if these contacts are made by means of screws or by being clinched into slots, high resistance contacts are always likely.

A further frequent cause of trouble is an open circuit in one of the main cables to the motors. This is immediately detected by the fact that the car will not start on the series notches and when the controller handle is moved to the parallel position will run on one motor only. If a car refuses to start till full series position is attained, probably the open circuit is on the controller connection. In this case an attempt should be made to start the car from the rear controller. If this can be done the fault will be immediately located. Wrong connections in the controllers may cause the car to jump on some notches, while bad contact at the controller fingers will also give rise to trouble. Defective controllers can always be detected by the above method of trying the other one. If the car works well on either controller, the motors and their connecting cables are obviously in good condition. On the other hand, should the car refuse to work on either controller, as it is unlikely that each controller will have a similar defect, the trouble is almost certainly in the motors or some other part of the electrical equipment.

A "SAFETY FIRST" MOVEMENT FOR INDUSTRY.

As a sequel to the conference held in London in June, at which it was decided to conduct throughout the country a campaign for the prevention of industrial accidents, an influential organisation has been formed comprising representatives of the Admiralty, Board of Trade, Home Office, Local Government Board and Ministry of Labour, and of leaders of industry and labour. Its title is the British Industrial "Safety First" Association. Its first meeting was held at the Mansion House on October 31, when Lord Leverhulme occupied the chair, and was elected president. The vice-presidents include the Presidents of the Local Government Board and the Board of Trade, the Ministers of Labour and of Food, the Under Secretary of State for the Home Department, Lord Aberconway, Rt. Hon. T. Richards, M.P. (South Wales Miners' Federation), Mr. W. A. Appleton (General Federation of Trades Unions), Lt.-Col. G. Harland Bowden, M.P., Sir Vincent Caillard (Vickers, Ltd.), Mr. C. T. Cramp (president, National Union of Railwaymen), Sir Kenneth Crossley (Crossley Bros., Ltd.), Mr. R. Dennison (Iron and Steel Trades' Confederation), Mr. C. Duncan, M.P. (Workers' Union), Sir John Jackson, Mr. W. Joynson-Hicks, M.P., Mr. E. Manville (president, Association of Chambers of Commerce of the United Kingdom), Major-Genl. the Hon. Sir Newton Moore, K.C.M.G., M.P., Sir Hallewel Rogers, G.B.E. (chairman, Birmingham Small Arms Co., Ltd.), Mr. H. B. Underdown (president, Association of British Motor and Allied Manufacturers, Ltd.), and Mr. Robert Young (general secretary, Amalgamated Society of Engineers). The hon. treasurer is Sir R. V. Vassar-Smith, Bart., D.L.

Briefly stated, the aim of the Association is the formation in every industry of a "Safety First" Committee, comprising representatives of employers and employees, and of Committees in the leading firms to investigate the causes of accidents peculiar to the particular industry, and to discover and apply effective measures and safeguards to prevent the recurrence of similar accidents. As numerous avoidable accidents are due to thoughtlessness on the part of the employees, a comprehensive educational campaign is proposed to be conducted from headquarters, and members of the Association will receive regular supplies of posters and literature designed to point out the known causes of avoidable injuries. Applications for membership of the British Industrial "Safety First" Association should be addressed to the hon. secretary, *pro tem.*, Mr. H. E. Blain, at the temporary offices of the Association, 31, Westminster Broadway, London, S.W.1.

Digitized by Google

THE
Tramway and Railway World

FOUNDED IN 1892 AND PUBLISHED BY
THE TRAMWAY AND RAILWAY WORLD PUBLISHING COMPANY, LIMITED,
AMBERLEY HOUSE, NORFOLK STREET, LONDON, W.C.2

SUBSCRIPTION RATES

THE TRAMWAY AND RAILWAY WORLD can be obtained, post free, at the following rates :

FOR THE UNITED KINGDOM—Twenty-five Shillings per annum.
FOR ALL PLACES ABROAD—Thirty Shillings per annum.
Single Copies—One Shilling (Postage, 2 pence—Abroad, 5 pence).
All back numbers—Two Shillings.

THE ANNUAL SUBSCRIPTION INCLUDES 64 ISSUES, OF WHICH 12 ARE ILLUSTRATED NUMBERS.

In consequence of the restrictions on the use of paper, readers will be unable to obtain copies of THE TRAMWAY AND RAILWAY WORLD unless a definite order be given in advance. Those who order copies in this way from newsagents and experience any difficulty in obtaining them should communicate with us.

THE EDITORIAL AND PUBLISHING OFFICES OF
THE TRAMWAY AND RAILWAY WORLD
ARE AT AMBERLEY HOUSE, NORFOLK STREET,
LONDON, W.C.2

Telephone No. : GERRARD *2948.*
Telegraphic Address : "TRAMIGRO, ESTRAND, LONDON."

LONDON, NOVEMBER 14, 1918.

Central Argentine Electrification.

The description of the electrification of the suburban lines of the Central Argentine Railway, which is concluded in this issue, brings out several points of special interest. The undertaking is the first conversion in South America of an extensive steam railway system (amounting in this instance to 100 miles of track) to electric propulsion. On the technical side, the main departure from arrangements with which we are familiar in this country is that the three-phase current is not generated at the pressure used for transmission but at a much lower voltage, and that by step-up transformers the tension is raised to 20,000 volts. By this method, well enough known in the United States, the problem of generator insulation is simplified. Apart from the use of step-up transformers, and from the fact that the working pressure on the conductor rail is somewhat higher than that generally used here, and so calling for efficient protection of the third rail, the general scheme is in essence similar to that with which we are familiar in this country. It is a scheme which has been well tried, and has proved its efficiency and economy for suburban services. Coming to another point of view, it is highly gratifying that the whole of the plant, steam and electric, has been designed by British engineers, and has been provided by British manufacturers. The importance of cultivating opportunities in the great and rapidly-developing countries of South America has frequently been pressed on British firms, and here there is an example of what can be done. There is an expectation of considerable developments in railway electrification in South America, and the initial success which our engineers, manufacturers and contractors have obtained ought to lead on to more. There can be no doubt that the Central Argentine installation will work excellently well, and it has already proved useful as an object lesson and missioner to other railways in South America. The fact also that our manufacturers are thus able to go afield should prove, if any proof is necessary, to English railway companies the capacity of our home producers to supply all that is necessary for the great schemes of British railway electrification which are now being discussed. Already such schemes are in the minds of Government departments, and something definite in the direction of a beginning of development has been indicated in reports by official committees on electric power supply. In the period of upheaval which has accompanied and will continue after the war much may be accomplished which at other times would seem impossible. It behoves the Government to take prompt action to further a general scheme of British railway electrification on all routes where it would be advantageous. This would be an essential part of any great development of electric power supply such as has been recommended. To enable the British industries concerned to make ready for the rapid execution of the work, the Government in conjunction with the railway companies ought to be maturing a scheme. Let it not be hindered by dilly-dallying over questions of the future relations of the railways and the State. These can wait. What is wanted for the immediate needs of the great industrial development necessary after the war is a general adoption of electric power for railways — and for other things. Many changes are needful, but none more so than cheap and abundant electric supply for traction and other purposes.

Digitized by Google

London Tramway and Housing Requirements.

Elsewhere in this issue will be found the observations on the subject of locomotion in the report presented to the London County Council by the Housing of the Working Classes Committee in relation to housing after the war. To overrate the importance of traffic facilities in connection with the proposed expenditure of a sum approaching three and a half millions sterling for the provision of housing accommodation would be impossible. On that account therefore it is necessary that the question of locomotion should be dealt with by experts. There are, however, no indications that such a desideratum has been complied with. Before the committee compiled their report the Council authorised the attendance of the chairman and vice-chairman of the Highways Committee at any conferences with other authorities in Greater London in connection with the housing question. Such procedure is decidedly belated, and is likely to give rise to misunderstandings when the consideration of traffic facilities comes before the conferences. Unless there are suitable means of communication, either existing or planned, housing projects are likely to make little progress. The time for the addition of representatives of the Highways Committee to the Housing Committee was before the latter proceeded to prepare the report to which reference has already been made, and the delegates ought to have been accompanied by the general manager of the tramways undertaking. If that course had been adopted it is improbable that the report would have contained the assertion that "for journeys exceeding seven or eight miles the railway, because of its speed, must remain the principal means of locomotion." From a traffic point of view that statement is clearly open to criticism. In support of it the report adds :—"Thus the journey by railway between West Croydon and Victoria occupies about 37 minutes, but by tramway car (including a change) it would occupy about 63 minutes." We may add that the distance by car is about 9½ miles, as compared to 10½ by electric railway, and that the car time might be reduced by several minutes if there was through running at the London boundary. Through running, however, cannot be instituted until Croydon Corporation make their track fit for the heavy London cars. Whether that will be done when it needs relaying is a question as yet undecided, but it is the only course that will remove the congestion at the changing point. Even from a pleasure point of view, on Sundays and holidays the traffic is heavy enough to deserve through facilities. It is by means of through running also that greatly increased traffic will be available, and considerable building land be opened up about the County Council's tramways and those of the London United Company near the London boundary at Tooting, the railway in this district running only to London Bridge. Fortunately the company obtained, with the support of the London County Council Tramways management, the necessary powers for through running and trailers shortly before the war. When circumstances permit the necessary arrangements to be made, we are convinced that in Mr. C. J. Spencer, one of the pioneers of through running, and now at the head of the London United Tramways, Mr. Fell will find an experienced supporter of his policy of extending the usefulness of the tramways by means of through running and trailers. It is in the various localities south of the Thames that the Housing Committee expect to find the sites for the greater part of such building operations as are possible within the County of London, but their report lamentably fails to note that in many districts their own tramways are conveniently situated for extensions both within and without the boundaries. A journey time of 50 minutes for 7½ miles is accomplished upon a number of existing routes, and with the adoption of fewer stops at rush periods, and sanction of increased speed on suitable sections, there is no reason why some reduction of the running time should not be effected. The price of land for housing is likely to be prohibitive in the vicinity of railways. Moreover, extension of tramways can be more easily secured than of railways. Indeed it may be affirmed that with one or two exceptions railway construction is physically impossible within an area of fifteen miles south of Charing Cross. It follows, therefore, that tramway extensions will be the only means of affording relief on an adequate scale to the existing and overburdened travelling facilities.

Digitized by Google

ELECTRICAL EQUIPMENT OF KEADBY BRIDGE.

A bridge over the Trent at Keadby, 14 miles north of Gainsborough, on the Great Central Railway, was opened in May, 1916. This bridge, of far more than ordinary interest, forms part of an elaborate deviation and widening scheme, and is known technically as a "Combined Railway and Highway Scherzer Rolling Lift Bridge," and has replaced the old swing bridge which carried the railway for nearly 60 years, whilst it also bears a public highway.

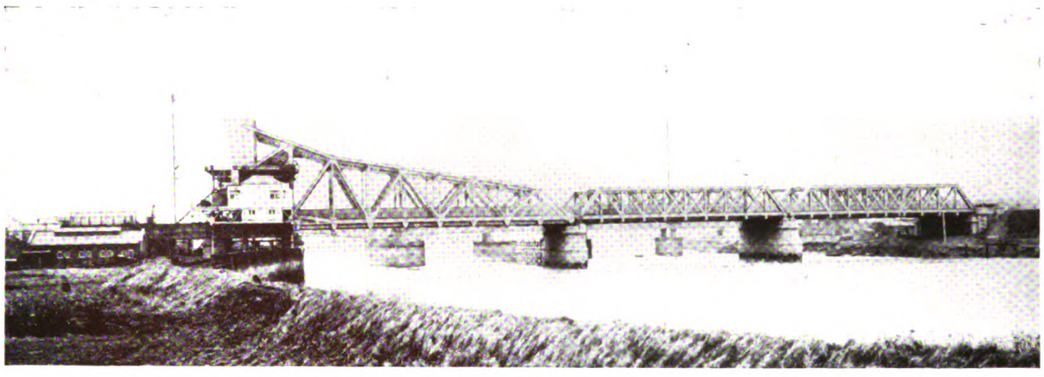


Fig. 1.—General View of Keadby Bridge from East Bank.

Its most remarkable feature is the rolling-lift opening span, which weighs over 2,900 tons, and is the largest in Great Britain, if not in the world.

When the question of the improvement of the railway line first came under consideration there was a strong desire that the span of the new bridge should be very much greater than that of the old structure, and that ample facilities for traffic across the river should be provided. The Scherzer system recommended itself not only as a complete structure entirely suitable to the special needs of the situation, but for the ease with which it could be built without interference with the traffic on the Trent.

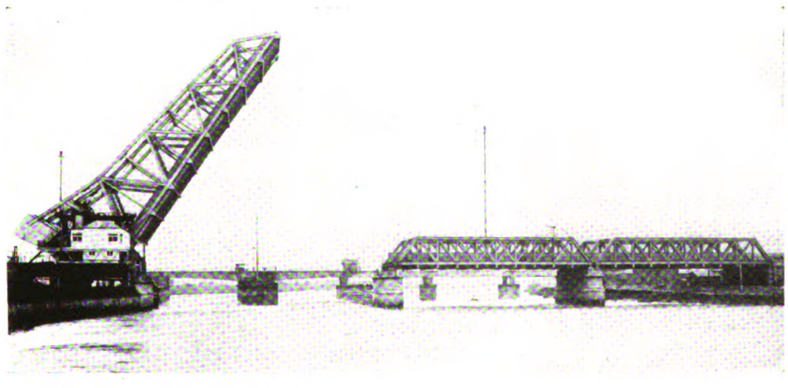


Fig. 2.—Roller Span Lifted.

The old swing bridge provided two navigable channels, each 60 feet in width, whereas the lifting span of the new bridge gives a clear waterway 150 feet wide, equal to the two openings of the old bridge, including the central dolphin and piers. The roller-lift principle enabled the constructional steelwork of the opening span to be built in a vertical position, leaving the river between the abutment and the pier in the river free for the passage of river craft.

The provision of a public roadway, parallel to the railway, together with new road approaches on both sides of the river, constitutes an inestimable advantage to the public. The old bridge was a railway bridge pure and simple, and there were no facilities for the crossing of the river within a distance of 15 miles.

The new bridge, as shown in Fig. 1, consists of five spans of the following dimensions :—Two fixed river spans of 135 ft. each ; a lifting span of 160 ft. giving, as already mentioned, a clear waterway of 150 ft. ; a track span of 40 ft. on which the lifting span rolls ; and an approach span of 70 ft. on the east bank of the river.

The bridge has a width of 53 ft. 6 in. between the centres of the outside girders, of which 29 ft. 3 in. is occupied by the railway and 24 ft. 3 in. by the roadway. Each span consists of three main girders, the central one dividing the roadway from the railway.

The three main girders of the track span form a path on which the lifting span rolls, and together have to sustain the weight of the lifting span.

The lifting span consists of three main trusses spaced at the same distance apart as the main girders in the fixed spans, and is counter-weighted at the rear end in order to secure balance at all angles of lift. The counterweight consists of a rectangular steel shell extending across the full width of the bridge (Fig. 5) and is heavily braced internally by lattice frames and strengthening girders. Its internal capacity is 24,780 cubic ft., and it contains 1,800 tons of concrete.

On either side of the lifting span heavy frames are built up alongside the track girders and anchored down to the supporting piers of the bridge. At their upper extremity these frames carry horizontal girders, to which are bolted the main operating tracks. The clearance between these frames allows the span to move freely as the bridge is raised or lowered.

The position of the racks coincides with the centre of the rolling circle of which the segmental girders form part, and the rotation of the pinions attached to the gudgeon pins of the moving leaf, as they travel horizontally along the racks, rolls the leaf backwards or forwards, so opening or closing the bridge. A horizontal platform at the level of the fixed racks is constructed on the leaf itself, and on this platform the lifting machinery is accommodated.

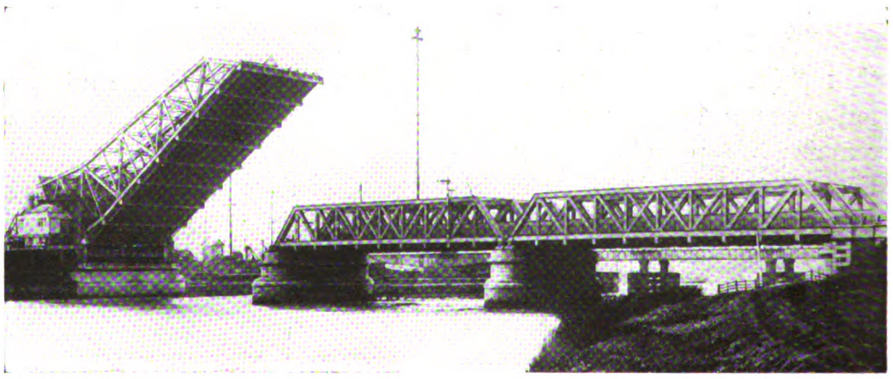


Fig. 3.—Showing Roller Lift Span being Lowered.

Generator Equipment.

Owing to the absence of power in the neighbourhood, a special plant for the generation of current was installed consisting of two 70-B.H.P. 4-cylinder petrol engines, running at 700 revolutions per minute and direct-coupled to two B.T.H. direct-current 6-pole shunt-wound generators of 50 KW. capacity at 220 volts. A storage battery of 128 cells is provided, capable of supplying the motors with current for about 30 operations of the bridge before recharging

Digitized by Google

is necessary. The arrangement of the generating plant and switchboard is shown in Fig. 6.

ELECTRICAL CONTROL EQUIPMENT.

The whole of the operations involved in the lifting and lowering of the moving leaf are normally controlled by electrical equipment designed and installed by the British Thomson-Houston Company, Limited, of Rugby.

The moving leaf is worked by means of two direct-current 115-H.P. 220-volt motors, having a normal full load speed of 380 revolutions per minute and an overload capacity of 100 per cent. These motors are

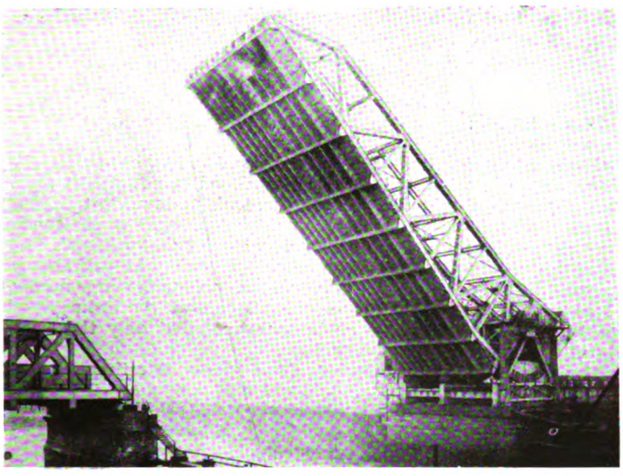


Fig. 4.—View of Roller Lift Span Raised.

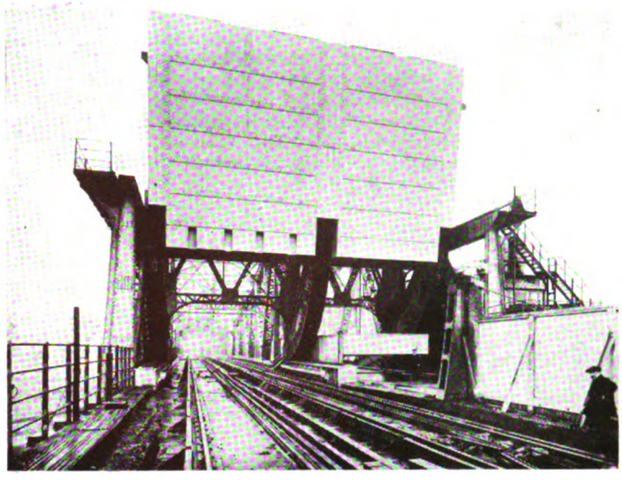


Fig. 5.—End View of Lift Span, showing Counterweight and Roller Paths.

compound wound with shunt starting fields, and are carried on the leaf itself; they are coupled back to back and arranged so as to work either singly or in parallel.

The method of control is such that by operating suitable switches either of the two motors can be used independently of the other and all safeguards apply to either arrangement; thus in the event of the breakdown of one machine it is possible to use the other under all but the most abnormal conditions.

The driving power is transmitted through independent trains of gearing to the main pinions on each side of the moving leaf. The angle of maximum elevation of the bridge when fully open is 81° 51′,

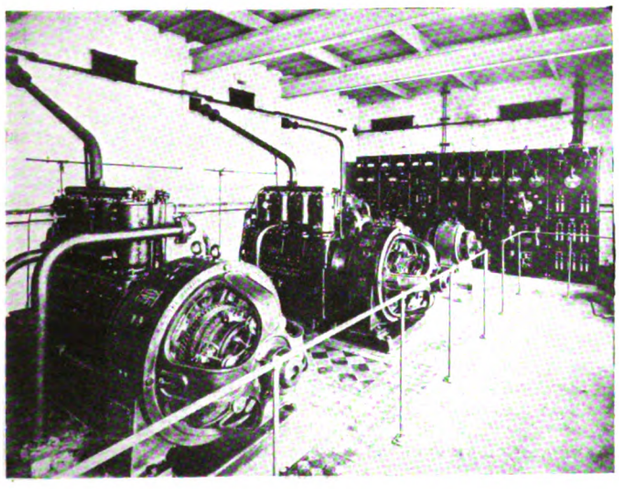


Fig. 6.—Interior of Power House, showing B.T.-H. Generators and Switchgear.

Fig. 7.—Interior of Operator's Cabin, showing Master Controller in Background.

and the time taken to open or close it electrically is less than two minutes.

Owing to the very exacting weather conditions to be met, and to the fact that it is essential to interlock the railway signal system with the operating gear for the bridge leaf, the control gear is somewhat complicated. In a bridge of this description it is essential that the interlocking arrangements shall obviate all possibility of either rail or road traffic using the bridge in any position but completely down. Further, it is essential that all safety devices shall be operated in such a manner that they act automatically in the event of failure of the power supply.

Arrangements are made so that when a circuit breaker opens, either in the operating cabin or in the main machinery house, all brakes are applied automatically.

The conditions to be met in the actual operation of the bridge leaf itself are very stringent. The leaf must be under the full control of the operator at all times and in all wind conditions, and it must be possible for an unskilled operator to open or close the bridge without causing any damage. The system of control adopted enables these conditions to be met quite easily in spite of the great mass of moving elements.

LOWERING THE BRIDGE.

The method of control adopted when lowering the bridge comprises series resistance control for the greater portion of the travel and diverter control with limited power for the last few feet of the travel. For this purpose limit switches are arranged in such a manner that at a pre-determined angle of the bridge when lowering, certain contractors are opened, thereby inserting series resistance in the armature circuit of the driving motors, while at the same time a diverter circuit is made to give a positive slow speed, practically independent of the load on the machines. At a slightly later period of the travel another limit switch operates, cutting off power entirely and causing the bridge to stop a few feet away from the ground level. The operator can then, by means of a special pedal switch equipment, inch the bridge down under diverter control with a limited amount of power; the provision of an oil buffer ensures that the leaf can be brought to the fully closed position without a perceptible jar. Further provision is made so that, by moving the controller handle at the same time as operating the pedal, it is possible to vary the amount of braking effect given by a special motor-operated brake, thus giving a variation in speed corresponding to the limited power already mentioned.

Digitized by Google

The braking arrangements are very complete and comprise two sets of brakes operated by a direct-current 1-H.P. 220-volt series wound motor, and two sets of solenoid brakes operating on drums geared to the driving motor shafts. All brakes are arranged to set automatically in the event of voltage failure irrespective of the position of the controller handle.

Raising the Bridge.

The method of control for raising the bridge is similar to that already described for lowering, except that no diverter control is provided; this is unnecessary, as the bridge is not usually opened to the full extent of its lift, and consequently the amount of over-run allowed is much in excess of that actually required.

There is one important factor in connection with the lifting, however, which has to be taken care of, namely, the effect of wind pressure. Under certain conditions a strong wind will actually run the bridge backwards, and special limit switches are arranged so that when this happens all brakes are applied when the bridge reaches a predetermined angle. This safeguard also comes into operation when starting to lower the bridge from the fully open position. This is essential, as under certain conditions a strong wind may take control and run the bridge backwards when the brakes are released, and before power is applied. This can be stopped, of course, by the operator applying power, but should he lose control and allow the bridge to continue to coast, the matter is automatically taken care of when the predetermined angle previously mentioned is reached.

Contactor Gear.

The contactor equipment for the control of the bridge movements is located in the machinery house. It consists of a panel for each separate motor, containing the various line and resistance contactors, overload relay and isolating main switch and fuses. This panel is controlled by a special controller comprising two parts, the first operating the contactor gear which makes the connections for raising and lowering the bridge, and the second varying the amount of resistance in series with the motor operating the brakes. Thus, by moving the controller handle, it is possible first of all to free the solenoid brakes, and then to vary the effect of the motor brakes from maximum near the off position to zero when the first power position is reached. A coasting point is provided between the last braking position and the first power notch so that, if desired, wind pressure can be used to lift the bridge, the motor and solenoid brakes being brought into action when it is desired to stop.

With the controller is incorporated a special locking magnet, operated from the signal circuits, which ensures that the controller handle cannot be moved to open the bridge until the signals are set to "danger." Further, the signals cannot be set clear until the bridge is in the fully closed position. A special motor is used in connection with the locking bolts between the rails on the moving leaf and those on the fixed span. These rails are locked in the down position by means of steel bolts controlled from the signal cabin. The bridge itself is locked in the down position by two heavy forged steel bolts worked electrically by means of a direct-current 1½-H.P. 110-volt series wound motor operated from the control cabin. These steel bolts engage with castings anchored to the pier, and arrangements are made so that it is impossible to operate the contactors for lifting until these bolts are withdrawn; the bolts cannot be closed when lowering until the bridge is right down and control has been cut off from the contactor panel.

Provision is made for reversing the motors by means of a special reverser situated on the moving leaf, and the special limit switches referred to in the foregoing description are operated by means of sprocket gearing which is driven from the main motor shaft. These limit switches are situated in the machinery house on the moving leaf.

Electrically operated gates, opened and shut by a direct-current 4½-H.P. 220-volt compound wound motor, are provided for the protection of the railway traffic. These gates are interlocked with the railway signals which, in turn, are interlocked with the control gear on the bridge.

This bridge was built to the designs and under the supervision of J. B. Ball, Esq., M.I.C.E., chief engineer of the Great Central Railway, by Sir Wm. Arrol and Company, Limited, of Glasgow; the electrical equipment was supplied by the British Thomson-Houston Company, of Rugby.

Review of the Foreign Press.—The War Office is now issuing fortnightly the Economic and the Reconstruction Supplements to the "Daily Review of the Foreign Press." The price of these supplements is 6d. The Economic Supplement deals with trade and commerce, railways and shipping, banking and finance, labour conditions, social and economic policy, and legislation, etc. The Reconstruction Supplement describes the measures being taken or suggested in Germany and elsewhere in connection with the return of peace conditions. These publications are issued by His Majesty's Stationery Office, and can be purchased through any bookseller or directly from H.M. Stationery Office.

HOUSING AND TRAFFIC IN THE LONDON AREA.

In a report from the Committee of the London County Council on the Housing of the Working Classes, an interesting survey of the subject is given, with special reference to the difficulties that will arise after the war. The present total of workmen's traffic in London and neighbourhood can only be approximately estimated. The number of passengers with workmen's tickets on the railways in 1913 (the only year for which the information is given in the Railway Returns) was as follows:—

London local railways	71,045,319
Trunk railways serving London, 138,658,643; of which the number carried in the London area would probably amount to	100,000,000
Total (say)	171,000,000

This total of 171,000,000 a year is equivalent to about 560,000 passengers a day.

The number of passengers at workmen's fares carried on the tramways in London and the neighbourhood is not known; but from the figures available for the Council's tramways it appears to amount to about 10 per cent. of the total tramway passengers. On this basis the number of passengers carried at workmen's fares on all the tramways in London and the neighbourhood would amount to about 80,000,000 a year. This does not include the large number of passengers carried on the workmen's cars at the ordinary 1d. (or ½d. fares, when these were in operation), but only those who travel at less than the ordinary fares.

The total traffic at workmen's fares as above estimated is as follows:—

	Number of passengers at Workmen's Fares. Year 1918.	Average daily number (approximate).
Railways	171,000,000	560,000
Tramways	80,000,000	260,000
	251,000,000	820,000

This means that about 410,000 persons of the working class travelled twice daily at reduced workmen's fares, of which the railways carried more than two-thirds.

The usefulness of the facilities depends on the fares charged, the hours during which the trains or trams run, and the frequency and speed of the service. The present position of such facilities is briefly stated in the following particulars.

Railways.

As regards the 2d. and 4d. workmen's fares on the various London railways, the former is the fare which is most important from the housing point of view, and the latter the fare beyond which only a comparatively small proportion of persons of the working classes can be expected to go.

It is pointed out that the 2d. (return) workmen's fares extend beyond the county on some lines, namely, to Canning Town, Plaistow, Stratford, Walthamstow, Enfield, and Golder's Green. The 4d. (return) fare limit is a considerable distance beyond the county boundary at practically all points on the north. On the south side of the Thames, the 2d. limit is much more limited, while the 4d. limit does not cover a considerable part of Woolwich and Lewisham.

As regards hours of service on the trunk railways, the trains arriving at the termini up to 8 a.m. are usually workmen's trains, with the exception of the Great Eastern and Great Northern Railways, on which the workmen's trains cease earlier and are in some cases followed by "cheap" trains. On the North London Railway, all trains arriving at Broad Street up to 8 a.m. are workmen's trains; on the District, Metropolitan and the Central London Railways, workmen's tickets are issued up to 7.30 a.m., while on the other tube railways workmen's tickets are issued up to 8 a.m., so that, for example, from Golder's Green a workman may travel for a fare of 2d. return by a train which arrives at Charing Cross (6·2 miles) at about 8.20 a.m. The number of workmen's trains on the trunk lines serving the north and west of London is small as compared with the number on some of the other systems.

Tramways.

The question of cheap traffic facilities on the tramways is simplified by the facts that the whole of the tramways in the County of London are under one authority and that common regulations apply throughout. Until May, 1918, there was a uniform workmen's fare of 1d. single, 2d. return, on all routes except that to Woolwich, where the 2d. (return) ended at Blackwall Lane, the fare having been 4d. return between Abbey Wood and Waterloo Bridge. Since May, 1918, these fare ratings have been suspended. The single fare for a journey over four consecutive sections on one car is now 1d., and the return fare over the same sections 2d. The average distance covered by the 1d. workmen's fare is 2·4 miles, and by the 2d. return fare 4·8 miles. Return tickets are issued at 3d. for any distance on one car, with transfers as previously given for 2d. return. The division of the Woolwich route is retained, so that passengers formerly paying 2d. now pay 3d., and those

Digitized by Google

formerly paying 4d. now pay 6d. All cars up to 8 a.m. (time of arrival at the inner termini) are workmen's cars, and all cars outwards up to 7.30 a.m. (time of departure).

On the tramway systems in extra-London there are considerable workmen's fares facilities. On the Metropolitan Electric system on the north, and the London United Tramways on the west, the workmen's fares on the routes were as a rule 2d. return. In the autumn of 1917, however, the fares on the Metropolitan Electric tramways were revised, and the workmen's fares of 2d. increased to 3d. in many cases, and to 4d. in a few cases. The London United Tramways Company seeks power by a Bill in the session of 1918 to increase its statutory limit for workmen's fares to ½d. a mile. Between the London and the extra-London tramway systems there is little co-operation in regard to such facilities, and where there are through services the workmen's fares remain the sum of the two independent workmen's rates.

While further co-operation in this respect between the systems is very desirable, it must be borne in mind that for journeys exceeding seven or eight miles, the railway, because of its speed, must remain the principal means of locomotion. Thus, the journey by railway between West Croydon and Victoria occupies about 37 minutes, but by tram (including a change) it would occupy about 63 minutes.

Omnibuses.

There are no workmen's fares on omnibuses, and hitherto the omnibus companies have made no move in the direction of giving workmen's fares. The hours at which the omnibus services commence, too, render them of little service for workmen's morning traffic. Few of the services commence before 7 a.m. (time of departure from the outer termini).

From the extent and arrangement of the motor omnibus services, the institution of workmen's fares on services at suitable hours would be of considerable advantage from the housing point of view. Before the war, the route length of the motor omnibus services in London and the neighbourhood exceeded the route length of the tramways; they serve many districts not served by tramways, particularly the central and western districts of the county; and they form in many cases connecting links with the railways, both of the outlying districts and at the London termini. They would in such cases form a useful auxiliary to the railway and tramway workmen's services.

General.

The increase in wages and other expenses of railways and tramways which has already taken place and which is likely to continue, at any rate to some extent, after the war, may affect the question of cheap locomotion for persons of the working class. Not only is the question of further improvement in such facilities now in abeyance but already some increases, and proposals for increases, in workmen's fares have been made, and there is no indication that these are to be limited to the period of the war. In one case, that of the London United Tramways, the proposal is that the increase is not to come into effect until six months after the termination of the war.

It is stated that as a result of the recent award by the Committee on Production, of £1 a week increase on pre-war wages to tramway workers, a conference of tramway employers and representatives of trade unions, has, by resolution, requested the Chief Industrial Commissioner to obtain from the War Cabinet an undertaking that the Government will take immediate steps to authorise the increase of the present maximum fares on tramways. It does not follow that any such increase would apply to workmen's fares, but their position is likely to be prejudicially affected by the increase of the ordinary fares. On the railways, whether under Government control or otherwise, workmen's fares have remained unchanged.

Other things being equal, any increase in fares must favour residence in the more central districts as compared with the outlying districts, and so operate to increase further the high rents in the central districts. Any increase in workmen's fares in the future is therefore likely to affect seriously the housing question in London.

Sites for Housing.

In dealing with the selection of land as suitable for the provision of new housing accommodation several considerations of broad policy must be carefully borne in mind. One which perhaps governs all the others, is that any sites considered should be in localities from which there is sufficient rapid and cheap means of locomotion, either existing at present or easily capable of being provided by the improvement of the present facilities. It appears that substantially, beyond the six-mile radius from the centre, tramways cease to afford the most satisfactory means of rapid communication, and that beyond this radius the time factor operates against the dispersal of population by this means of locomotion. For the necessary facilities for the greater distances, recourse must be had mainly to the railways. While the 2d. return fare on the northern side of the river extends to places beyond the county boundary on the east and northern portions and far beyond in the case of Enfield, on the southern side of the river the limit of 2d. fare on railways is very restricted and does not include more than approximately one-sixth of the county south of the river.

LONDON UNITED TRAMWAYS.

BETTER DAYS IN PROSPECT.

A new era in the history of the London United Tramways will take its beginning from the present time. In the end of October a Bill of the utmost importance for the tramway company and the public whom they serve was passed by a committee of the House of Lords, and as it has already received the sanction of the House of Commons, it will probably have become law by the time this issue is published. The measure is designed to put an end once and for all to the troubles of the company and their undertaking, and to set them on the high road of efficiency and prosperity. To understand the situation, and to realise fully what the intention of the Bill is, it is desirable to take a glance over the chequered career of the company.

HISTORICAL.

In the year 1881 the West Metropolitan Tramway Company was promoted to construct a system of horse tramways from Hammersmith Broadway to Kew Bridge, and from Shepherd's Bush to Kew Bridge and Acton, a total distance of 7½ miles. The undertaking did not flourish, and in 1894 it was acquired by the group of capitalists and engineers at the head of the Bristol tramway system. The lines were relaid, new cars obtained, and the horse car service was improved. The name of the company was changed to the London United Tramways, Limited, and the present system was planned and gradually realised. The Bristol group, at whose head was the late Sir George White, had prophetic views, and were cognisant of the developments in electric traction which were taking place in the United States and were beginning in England. In or about 1895 Sir (then Mr.) Clifton Robinson began his historic campaign among the local authorities and the public of the western outskirts of London in favour of electric traction on the overhead wire system. It was an uphill fight, for the prejudice against overhead wires was so intense as to be almost unbelievable nowadays. Even well-intentioned members of the London County Council attacked the company for desiring to shut out the sunlight from London streets by their hideous wires. To overcome this unintelligent opposition much persistent and energetic propaganda work in various novel ways, including publication of special local newspapers, was carried out, and apparently endless negotiations with local authorities occupied two or three years. The amount of local interest was enormous, and the subject was made a test one at the municipal elections. At length, in 1898, the company succeeded in getting a Bill through Parliament authorising the conversion of the horse lines to electric traction. The first electric cars taking energy from overhead wires began running in April, 1901, and they proved a valuable object lesson. This achievement would have been attained earlier, but the powers obtained were hung up for two years owing to the Kew Observatory difficulty. The authorities of that institution contended that leakage of current from the tramway rails would affect magnetic observations at Kew. The objection was at last got over by the tramway company paying the cost of the removal of the Observatory to another part of the country far from electric or other disturbances.

From time to time the company obtained powers for extensions of the system both on the Middlesex and Surrey sides of the Thames, and the lines linked together a large number of towns and villages, bringing a vast convenience to the population. The opposition of local authorities, however, was sometimes bought off at very high prices, as the company were obliged to undertake expensive road widenings and wood paving in places where otherwise such innovations would not have been dreamed of. Thus the capital account of the company went up in an alarming way. The power-station erected at Chiswick was regarded as the last word in plant and equipment, and tracks and cars were of the most approved types of the time. In April, 1903, the important extension to Hampton Court was opened, and three years later the Surrey lines came into operation. Because of events some of the authorised rural extensions have never been constructed.

FINANCIAL.

The fares charged were fixed by statute, so far as maxima were concerned, and on the average the highest rate which the company could charge was about a halfpenny per mile. In some places it was a penny for three miles. In the earlier years of electric traction on the system, when only the best paying routes were open, and when the cost of maintenance was naturally low, the company prospered. For the year 1903 the dividend on the ordinary shares was 8 per cent.; for 1904 it was 6 per cent.; but for 1905 it fell to 3 per cent. Just after this the control of the company passed from the Bristol group to the London underground railways group, and this was followed by interchange of traffic arrangements with the underground railways. For 1906 the dividend was 3 per cent., for 1907 2 per cent., and for 1908 it fell to zero. The serious falling off in receipts beginning in 1906 was partly due to the coming into existence of motor omnibus competition and partly to the development of electric traction on railways. The call for maintenance and renewals of the tramways and their equipment also became acute.

Digitized by Google

In the report of the directors for 1908 the auditors noted that no allowance had been made for depreciation. The capital of the company at this time included nearly £1,000,000 spent on road widenings, capitalised wayleaves, and other outlays necessary to get the consents of the local authorities. It was recorded that some 30 local authorities had to be negotiated with.

For 1900 no dividend was paid on the ordinary shares, and even the preference shares had to go without. The latter fact arose from the policy then adopted of utilising all available surplus either for immediate repairs or for forming a fund for future maintenance. In 1910 Sir Clifton Robinson retired from the managing directorship of the company, and undertook commercial missions for the underground railways group in the Far East and in America. In the latter part of the same year he died suddenly in an electric tramway car in New York. He was succeeded in the post of managing director by Mr. (now Sir) A. H. Stanley.

In succeeding years such profits as the undertaking made were regularly set aside for repairs and renewals. These funds, however, were not sufficient for the purpose, as was proved by the lamentable state into which the tracks in many places fell. For 1913, however, a dividend of 1 per cent. was paid on the preference shares, and for 1914, ½ per cent. Then the war conditions came on. No dividend was paid for 1915, and for 1916 conditions grew still worse, and there was an adverse balance of over £2,000. The directors announced that it was expected that for 1917 the results would be still less favourable, and in view of the fact also that a large sum would be required for the purpose of placing the undertaking in a proper condition of repair, proceedings were commenced by a debenture stock-holder for the appointment of a receiver pending the preparation of a scheme for the reorganisation of the company's capital.

This announcement was the forerunner of the scheme which is authorised by the Bill which the company have obtained this year. In June, 1917, a receiver was appointed, and negotiations were set on foot for the reconstruction of the company's capital and the rehabilitation of the tramway undertaking. These resulted in a provisional arrangement under the terms of which, subject to Parliamentary sanction being obtained, both the loan and share capital would be substantially reduced, and funds would be provided for the reconstruction and renewal of the tramways.

The last balance sheet of the company shows that the authorised capital was £2,500,000, divided equally into cumulative preference shares and ordinary shares. The issued capital was £1,250,000 of cumulative preference shares and £1,000,000 of ordinary shares. The loans, including debenture stock and debentures, amounted to £1,750,000. The total was thus £4,000,000, and as the system extends to about 100 miles measured as single track, the capitalisation was equal to £40,000 per single-track mile. Considering that much of the route is in regions of comparatively light traffic, it is not surprising that with the low fares charged it became impossible to pay dividends.

L.C.C AND CHISWICK POWER-STATION.

Before going on to refer to the company's Parliamentary Bill of this year, the interesting episode should be mentioned of the purchase by the London County Council of the Hammersmith lines, this being the part of the company's undertaking which is situated within the county of London. This embraced 5½ miles of route. Arbitration, litigation, and negotiation went on for two or three years, and the final settlement was only reached at the end of 1917. In the course of the proceedings it was laid down—much to the chagrin of the County Council—that the latter, in making the purchase of the lines under the compulsory powers of the Tramways Act of 1870, must buy also the Chiswick power-station of the company. The terms finally agreed to were that the Council should pay £235,000 for the tramways, the power-station, car depot, and offices at Chiswick, the completion of the purchase to be postponed till the end of the war. On the completion of the purchase there are to be mutual running powers between the Council and the company. Prior to the settlement the Council had advanced £61,000 to the company for the reconstruction of the Hammersmith lines. This payment is in addition to the purchase price. The Council also pay £22,000 of costs, bringing their total outlay up to £321,000, or equal to about £58,000 per mile of route—practically all double track. The company will take all the electricity they require from the Chelsea station of the underground railways. Their Surrey lines are already supplied from that source.

THE COMPANY'S BILL.

The Bill which the company have this year obtained from Parliament seems well adapted to clear away troubles. While its financial provisions are so reasonable that finally there was very little opposition to it, the preamble gives a succinct account of the circumstances dealt with. The right of compulsory purchase by the local authorities arises in the case of various portions of the undertaking at different dates, the earliest in 1924. The terms as to payment are as regards certain portions of the undertaking those prescribed by Section 43 of the Tramways Act, 1870, and as regards the remainder they are the fair market value as a going concern. Certain of the authorised tolls and charges do not afford adequate remuneration to the company. Principally on this account, and because of the increase in working expenses, the company were unable to pay the 1917 interest on their mortgage debenture stock. Partly owing to the financial difficulties of the company, and partly owing to the scarcity of labour and materials during the war, the condition of the tramways and the rolling stock has become impaired. In the circumstances it would be impracticable for the company to raise the capital for restoring the undertaking.

The Bill accordingly provides in the first place that the power of purchase by any local authority shall not be exercisable before the year 1950, and that the terms will then be those prescribed by Section 43 of the Tramways Act. In regard to fares, these are fixed at a maximum of a penny a mile, the change to come into effect six months after the end of the war. The routes are to be divided into half-mile stages. In no case are the company to be bound to charge less than a penny. Power is given to the Board of Trade, subject to the maximum provided, to alter the fares if sufficient cause is shown to a referee.

In regard to the financial provisions, the company are to apply for the sanction of the High Court to a scheme to reduce the capital to £1,000,000 of mortgage debenture stock, £963,000 of 5 per cent. preference shares or stock, and £660,000 of ordinary shares or stock—total, £2,623,000. Of the mortgage debenture stock, £142,000 will be reserved for issue as and when required. For five years after the war the dividend on the preference shares in respect of any year shall only be payable out of the revenue for that year. The dividend on the mortgage debenture stock will be limited to 4 per cent. per annum. Arrears of dividend on the existing cumulative preference shares will be cancelled. The right to issue further capital is retained. The company are as soon as possible to put their undertaking into good condition and repair. Until the company have expended on reconstruction or set aside for that purpose sums amounting to £400,000, they shall not declare or pay any dividend on their preference or ordinary shares. The company are to apply towards the reconstruction the £235,000 to be paid under the agreement with the London County Council for the purchase by the latter of the Hammersmith lines and Chiswick depot. (The agreement is scheduled to the Bill.) The company are also to use for the reconstruction their surplus accumulated revenue amounting to £60,000.

From January 1, 1919, the revenue of the company, so far as available, is to be applied, after paying debenture and other interest, in paying to a special reserve fund for five years from January 1, 1919, £60,000 a year; for four years from January 1, 1924, £40,000 a year; and for every year from January 1, 1928, £30,000. A deficiency in any one year need not be made up in the next. Any money over may go in preference and ordinary dividends. The special reserve fund is to be applicable only to reconstruction, but no part of it is to be so used until the company have expended on reconstruction the whole of the previously mentioned £400,000.

It will thus be seen that the scheme is a very complete one. For meeting the cost of reconstruction there is the nest-egg of the purchase money from the County Council to begin with, and as something approaching a million and a half is written off the capital, it will be the easier for the company to accumulate money out of revenue for reconstruction work. The new manager of the company, Mr. C. J. Spencer, late of Bradford Tramways, should have a busy and interesting time, and one giving large scope for his abilities.

UNIFORM FARE SUGGESTED FOR EDINBURGH.

In connection with his suggestion of a uniform fare for the Edinburgh tramways, which is being considered by the Tramways Committee, Councillor M'Laren has issued a memorandum on the proposal to members of the Committee. He points out that in the United States an average fare in cities of 2½d. is charged for any distance with transfers. In cities like New York and Chicago a distance of 20 miles can be travelled for this sum. Several Canadian cities have also adopted the system with certain modifications. In Winnipeg tickets are sold—one for 2½d. and six for 1s. 0½d., available any time, others for restricted times at cheaper rates, the average fare being a little less than 2d. The balance-sheet of the Edinburgh District Tramways Company for 1913 showed a profit of £26,577, the average fare working out at 1·102d. An average of six tickets for 0½d. on the same basis of passengers carried would give a profit of £21,474, but as a single ticket would have been 1½d. the profit would have been much larger. In 1917 the profit was £35,219, and the average fare 1·269d. Under the system suggested the profit would have been £13,924 but then, again, as a single fare would have been 1½d., the gross profit would have been as large as that shown in the balance-sheet. At present the increased tramway charges caused by the war are largely paid by suburban residents. As regards the housing problem the adoption of the average fare would, Councillor M'Laren contends, effect a radical improvement.

The Kearney High-Speed Railway is the title of a pamphlet reprinted from the Transactions of the Society of Engineers (Incorporated). It is of interest, as containing a report of a lecture on the subject indicated given by Mr. E. W. Chalmers Kearney at a meeting of the Society and of the discussion which ensued.

Digitized by Google

POST-WAR POSITION OF ELECTRIC POWER SUPPLY.

MR. HATTON'S PAPER READ AT THE MUNICIPAL TRAMWAY ASSOCIATION'S CONFERENCE.

By A. Horsburgh Campbell, M.Inst.C.E.
(*City and Tramway Engineer to the City of Edinburgh.*)

It was with much regret that the writer was unable to avail himself of the invitation with which he was honoured to attend the annual conference of the Municipal Tramways Association at Leicester. He looks forward to future conferences when the Edinburgh Corporation will have entered into the realm of actual operation of their tramways system. Meantime, he desires to offer the following contribution to the debate on Mr. Hatton's paper.

The paper raises at least two points in which the City of Edinburgh has at the present time, and in early anticipation, a special and peculiar interest. These are central generation from super-power stations and the relations of the electric supply department to tramway traction.

On the first point—that of super-power production—the tramway world has a prime concern, and therefore the paper is most opportune, and may be helpful. It is interesting to note that taking some 82 or thereby of the municipal tramway systems, there are only 13 systems, or, roughly, one-sixth, which have their own separate generation of power; the remaining five-sixths purchasing their power from the electric undertaking of the city or town.

The comparisons for cost of current separately generated, and purchased are :—

1. Separately generated from (which necessarily is exclusive of capital cost) ... ... 0·41d. to 1·21d. per unit.
   Or say from ... ... ⅜d. to 1¼d. per unit.
2. Purchased from the electric undertaking from (exclusive of capital costs again) ... ... 0·54d. to 1·20d. per unit.
   Or say from ... ... ½d. to 1¼d. per unit.
3. If capital costs be included these charges become ... ... 0·84d. to 1·62d. per unit.
   Or say from ... ... ⅞d. to 1⅝d. per unit.

It thus appears that the difference between the working costs of separate generation and that of purchase is so minor as to be practically negligible, but if the capital costs be added to the works cost, the scale must turn substantially in favour of combined generation of power, for light as well as for traction. The wisdom of the practice which has grown up in the preponderance (viz., as 5 to 1) of the joint station whereby the current is purchased by the tramway department, seems thus amply demonstrated.

This, however, is but a step along the path of the greater combination proposed in the recent report which has been issued on electric power production from super-stations, set down at or near the pitheads.

With the economic motive inspiring this great centralisation no fault can be found; with the resultant effect upon municipal tramway interests (representing probably the largest individual users of current) much concern must be felt. It therefore behoves the tramway authorities to take at this early stage, not only a watchful but a very active interest in this movement to ensure that the potential economies from central or super-power generation will be reflected in the tramway interest by correspondingly reduced charges for current supplied. It may be said that the unity of the present arrangement, which makes the tramway department merely subjective to the electric light department renders separate action unnecessary, and that the interests of the tramways will be fully conserved by their manufacturers or purveyors of current, in the electric department.

I do not so view the relations of the two departments of the municipality. The tramways are far too important to suffer their interests in this economic evolution, to be absorbed or wholly merged in and by the electric light department. And when it is remembered that the proposals as sketched in the report are as yet too vague to show the effect of this titanic development in electric power production, it would be well for the tramway interest to exert and assert its own separate influence in the thorough and exhaustive examination of the proposals, and in securing that the result shall be to the decided betterment of the tramway world. Unless the great consumers of current rise to the opportunity now offered, there is danger that the public interest, represented by the municipalities, may fail to reap their rightful share of the economy latent in the conception of the report, which in its national effect must be of immense importance, vital indeed to the industrial and transport interests of the country.

The second point—that of the relations of consumer to producer—touched upon by the author of the paper on page 2, is important, and in prospect of the developments above referred to, acquires more than local interest; for if this movement for super-power generation materialises, it will involve a complete recast of the relations and charges which now exist. Locally, to the City of Edinburgh it possesses under the existing condition a more than ordinary interest. The many points that arise, and the factors that come into play for skilled determination of the purchase price for electric current are of paramount importance to the new tramway era dawning in the Scottish capital. But it is rather with the general than the local application that the conference is concerned, and here we are driven back to the point the writer has sought to make in the foregoing observations, that a careful study will become necessary on the part of tramway experts and their committees of the questions and factors that should fairly regulate the price of current under the new era of electric generation on that "super-scale" foreshadowed by the reports of the Reconstruction Committee.

For help and enlightenment upon those points, the writer would refer the conference to that most valuable paper by Mr. Yerbury, and the exhaustive debate on this subject, published in the proceedings of the Institution of Electrical Engineers, Vol. 44, Session 1909–10.

With all deference to the author in his very natural claim for the Durham coal fields as the fitting place for a first super-power station, may I—animated by like feeling of local patriotism—direct attention to the superlative claims of the Lothians coal fields, which under prevailing conditions in their relation to the Scottish metropolis, offer an ideal area, and unique opportunity for pioneer effort in the economic production of power on the "super scale." The City of Edinburgh has anticipated such a development in the excellent site secured on the immediate confines of the coalfields of Midlothian and of the city itself, for the erection of a Central—super-power—Station. All that is wanting is the release of war-time restrictions for progress to be made, and the developments of the Forth and the Lothians' area offer a fit field for this pioneer enterprise.

STAFF EFFICIENCY MEETINGS.

At the first meeting of the fourth series of Operating Department efficiency meetings in connection with the London Underground Railways and London General Omnibus Company, Limited, group, held at the L.G.O.C. Training School, Chelsea, Mr. H. E. Blain (operating manager) presided over an attendance of about 250 members of the administrative and control staffs. A cinema lecture entitled "Some Topical Camera Productions in connection with the Underground Railway and L.G.O.C." was given by Capt. A. Rozier (superintendent of employment and training, L.G.O.C.). The lecturer had gathered together some exceedingly interesting illustrations both of past transit facilities and of present developments in the London area. The films and slides included an excellent new film of a trip on the District Railway showing some fine pictures of the Lots Road Power Station, and a series of slides on road locomotives, showing types of vehicles from 1770 to the present date, which pictured graphically the evolution of traction and its application to passenger and goods transport. Other topics illustrated were the conversion of an omnibus from petrol to gas fuel and an instructive series showing the latest developments in the training of omnibus employees in first aid to the injured, the slides depicting improvised splints and bandages which can be made up from the tools and equipment carried on an omnibus. The November meeting has for its subject "Omnibus Maintenance."

SERVICE LORRIES FOR DISPOSAL.

In connection with the difficulty experienced by local authorities in maintaining their transport services, the Director-General of National Salvage notifies that he has given the matter consideration and hopes shortly to be in a position to offer a number of 3-ton covered petrol lorries for sale or hire to local authorities. The vehicles have been used by the War Department and cannot be guaranteed, but it is expected that they will be serviceable to local authorities. On hearing from Councils he will place their names on his list and inform them when he has vehicles suitable for their inspection.

Coal Saving Bonus.—The London County Council recently approved a scheme for the distribution of a coal saving bonus to drivers and conductors on their tramways. During the past quarter encouraging results have been obtained. The saving represented £3,288 7s. 4d., half of which sum has been distributed in accordance with the scheme. The attention of drivers and conductors has been called to the fact that the saving in coal for the first quarter being slightly under 5 per cent., a much greater saving and consequently greater bonus can be obtained by further perseverance and care.

Reinforced Concrete Freight Car.—The Board of Trade Journal gives currency to a report that a contract has been let in the United States for the building of a reinforced concrete gondola freight car, which will be completed in 60 days. The car is to have a capacity of 100,000 lbs. and a length of 40 ft. It will cost several hundred dollars less than wooden and steel cars of the same type, and will require only 6,000 lbs. of steel in its construction as compared with 32,000 lbs. for the ordinary steel cars.

Digitized by Google

BLACKPOOL TRAMWAYS UNIFICATION.

A Report by Mr. Charles Furness,
Borough Electrical Engineer and Tramways General Manager.

The proposed unification of the several tramway systems of Blackpool is the subject of a report which has been recently prepared for the Blackpool Corporation by Mr. C. Furness, borough electrical engineer and tramways general manager. The report is of so much interest and importance, not only to the local authority concerned but to all those who realise how necessary is the connecting up of adjacent tramway systems, that we give it in full.

Preliminary Report on the Proposed Unification of

Blackpool Corporation Tramways ...	21½	miles single track.
Blackpool and Fleetwood Tramways...	15	,, ,,
Blackpool, St. Annes, and Lytham Tramways	11½	,, ,,
Total miles single track ...	48	

"The prosperity of Greater Blackpool in the future will in no small measure depend upon the transportation facilities provided by the Corporation in enabling its residents and visitors to travel with ease and comfort to and from any part of the borough over the municipalised tramways of the Blackpool and Fleetwood Tramroad Company, and the Blackpool, St. Annes, and Lytham Tramways.

"Discontinuity of a tramway service by reason of parochial or municipal boundaries is probably one of the most unfortunate things you can have in connection with transportation. At the present time the three tramway systems operating within the borough are restricted in their administrative and effective usefulness to the general travelling public by a lack of co-ordination in their independent services, and passengers desiring a rapid and easy means of travel between the boundaries of Lytham, St. Annes, Blackpool, and Fleetwood, are obliged to travel over three separate and independent tramway systems.

"Doubtless in the early days of tramways it was felt too speculative a business for municipalities and public authorities to venture upon, and hence the majority of pioneer tramway systems in this country were promoted and operated by private companies, whose first interest was the earning of substantial dividends rather than the public convenience in easy and cheap passenger transport facilities. However, with the advent of the electric traction motor, municipalities (and amongst them Blackpool) were quick to realise the possibilities of electric traction, and undoubtedly the purchase of the original conduit tramway system from the Blackpool Electric Tramway Company in 1892, and its conversion to overhead traction, was the beginning of the great transportation business on this coast, which has since grown to over 30 million passengers per annum on the three local systems.

"During the past 15 years the number of passengers carried over these tramways has increased three-fold, and I estimate with a unified system under the Corporation the tramway traffic between Fleetwood and Lytham will grow even more rapidly. A very moderate estimate of the traffic over the joint tramways under the administration of the Blackpool Corporation in the near future, say within six years of joint operation, will be in the neighbourhood of 55 million passengers per annum, with a total revenue of £340,000.

"The linking up of the three tramway systems under one administrative body will enable the Tramways Committee to give more efficient and frequent services to all parts of the district.

"The tramway undertaking of the Blackpool and Fleetwood Tramroad Company will come into the scheme of unification in the near future, and it now only remains for the amalgamation of the urban districts of St. Annes-on-Sea and Lytham to enable the Corporation to treat for the purchase of the Blackpool, St. Annes, and Lytham Tramways, which they will be able to do in the year 1921, under Section 43 of the Tramways Act, 1870, which reads as follows:

> "Where the promoters of a tramway in any district are not the local authority, the local authority, if, by resolution passed at a special meeting of the members constituting such local authority, they so decide, may within six months after the expiration of a period of 21 years from the time when such promoters were empowered to construct such tramways, and within six months after the expiration of every subsequent period of seven years, etc., etc., require such promoters to sell, and thereupon such promoters shall sell to them their undertaking, or so much of the same as is within such district, upon terms of paying the 'then value' (exclusive of any allowance for past or future profits of the undertaking, or any compensation for compulsory sale or other consideration whatsoever) of the tramway, and all lands, buildings, works, materials, and plant of the promoters, suitable to and used by them for the purposes of their undertaking within such district, etc.

"Note 1.—On a sale to the local authority the local authority becomes entitled to the exclusive use of the tramway, not by transference from the Company, but by virtue of the statute alone, and the statute converts what was a terminable right in the company into a permanent right in the local authority.

"Note 2.—To the company the value of these powers while they can be exercised is great, but the value of them as a saleable article at the times when they can be compelled to sell them to a local authority under Section 43 is nil, inasmuch as on such sale they terminate automatically so far as the company are concerned.

"The capital expenditure on the tramways undertaking of the Corporation for the year ending March 31st, 1918, amounted to £317,000, and with the additional capital commitments of £270,000 for the property of the Blackpool and Fleetwood Tramroad Company, and the prospective purchase at its material value of the tramways of the Blackpool, St. Annes, and Lytham Company in the year 1921, together with the developments proposed in connection with our own tramways, viz., the extension of the promenade track southwards to link up with the St. Annes lines at Squire's Gate; the extension of the New Road route to Hoo Hill; the linking up of the Fleetwood lines at the Gynn; the provision of new car repairing and engineering workshops and administrative offices at Rigby Road and the purchase of new rolling stock, etc., will bring up the capital expenditure of the tramways for the operation of a unified system to approximately £800,000 within six years of the scheme receiving the sanction of the Board of Trade.

"A new tramways depot, with car repairing workshops and engineering plant of modern construction, will be required, and I have made a preliminary survey of Rigby Road Highway Yard, and consider this site an ideal one for an up-to-date central tramways department capable of dealing with the transportation business of the borough and district for the next 20 years, and recommend that at least four acres be rented or sold to the Tramways Committee for the purposes of this development.

"At this stage I do not consider it desirable to give full details making up this estimated capital figure of £800,000, as the property of the Blackpool, St. Annes, and Lytham Tramways Company has yet to be valued, but I have made ample provision for covering the 'then value,' which is exclusive of any allowance for past or future

Comparison showing Increase in Traffic Receipts and Passengers Carried on Three Tramway Systems—Period 15 Years.

System.	Passengers carried.				Gross receipts.		
	1902–3	1917	Increase	Ratio of Increase	1902–3	1917	Increase
Blackpool Corporation	5,809,190	17,810,538	12,001,348	3	£41,818	£96,224	£54,406
Blackpool, St. Annes, and Lytham	1,236,230	5,207,967	3,971,737	4	£13,531	£42,962	£29,431
Blackpool and Fleetwood	2,049,677	4,000,000	1,950,323	2	£30,474	£44,531	£14,057
Totals	9,095,097	27,018,505	17,923,408	3	£85,823	£183,717	£97,894

Blackpool Corporation Tramways.

Gross receipts for the year ending March 31st, 1918 ... £119,339
Passengers carried for the year ending March 31st, 1918 22½ millions.

Estimated gross receipts for the year ending March 31st, 1919 ... ... £145,000
Estimated passengers carried for the year ending March 31st, 1919 ... ... 26 millions.

Digitized by Google

profits, the result being that the amount ultimately to be paid in compensation will be measured by what it would cost at the date of sale in the year 1921 to construct the tramway lines, subject to a proper deduction in respect of depreciation, but with no allowance for the rights, powers, and privileges of the company.

"The estimated result of the sixth year of operation after the scheme of unification has been completed is as follows :—

"TRAMWAYS.

"Total receipts from all sources	£340,000
"Total expenditure	208,000
	£132,000
"Interest and Sinking Fund on estimated capital expenditure of £800,000	72,000
"Net surplus	£60,000

"The possibilities of new traffic developing over the tramways between Fleetwood and Lytham, over lines having a total of 48 single track miles, will be very great, with the boom of building which is almost certain to follow after this world war has been successfully concluded.

"At the present time, owing to the restrictions under the 'Defence of the Realm Act,' the borough of Blackpool, which normally increases its residential character by the addition of 500 new houses per annum, has now a lee-way of some 3,000 houses to erect within its old borders, and with the extension of the borough north to the boundary of Fleetwood, and to the south by the amalgamation of the urban districts of St. Annes and Lytham, the influx of new residents and visitors will create demands for transportation which will test the Corporation resources to their utmost, and it is therefore necessary that your Tramways Committee be authorised to make every preparation to meet the growing traffics which are bound to follow on the future development of Greater Blackpool."

FURTHER DEMANDS FROM TRAMWAY WORKERS.

AN APPEAL TO BE MADE TO THE COMMITTEE ON PRODUCTION.

Notwithstanding recent awards in their favour, tramway employees are still dissatisfied with their conditions of pay and work. About the middle of last month the various Corporations and companies owning tramway undertakings received a communication from the National Transport Workers' Federation (signed by Mr. Robert Williams, the secretary) as follows :—

"As the result of representations made to this Federation by the affiliated unions catering for tramway and omnibus workers, I am directed to make formal application to you for the following alterations in wages and working conditions on behalf of all employees (other than skilled craftsmen), male and female, who are members of unions affiliated to this Federation :—

1. That equal payments be made to women as to men in the tramway and motor omnibus undertakings in the United Kingdom.
2. That the position of youths between 18 and 21 years of age shall be maintained in accordance with the award of March 8, 1918.
3. (*a*) That the war wage at present paid to males and females 18 years and over shall be increased by such amounts as shall give 35s. per week war wage. Payments to be made on a basis of a week of six days or six shifts.
   (*b*) That youths and girls under 18 years of age shall be paid half the total war wage paid to the employees over 18 years of age, except where youths or girls are performing adults' work, when they shall receive adults' pay.
4. (*a*) That all spread-over time in excess of one hour within a duty shall be paid for as though worked.
   (*b*) That where the spread-over time of a duty exceeds ten hours and is under twelve hours, all time in excess of ten hours shall be paid for at the rate of time and a half.
   (*c*) That where the spread-over time of a duty exceeds twelve hours, all time in excess of twelve hours shall be paid for at the rate of double time.
5. That in the event of services being curtailed or reduced, the full weekly payments in operation at the time of such curtailment or reduction shall continue to be paid in addition to the current war wage.
6. That this application is made on behalf of and is intended to include all employees (other than skilled craftsmen), male and female, whose unions are affiliated to the National Transport Workers' Federation.

"I shall be glad if this is given immediate consideration by your association or company, and on behalf of the Federation and the unions concerned I have to say that we are willing to appoint representatives to a conference to discuss a settlement of the above claim, or, failing agreement, to submit the matter to the Ministry of Labour for arbitration before the Committee on Production. I am sending a copy of this letter to the Chief Industrial Commissioner."

The list of unions concerned is as follows :—Amalgamated Association of Tramway and Omnibus Workers, London and Provincial Union of Licensed Vehicle Workers, National Union of Vehicle Workers, National Union of General Workers, and Dock, Wharf, Riverside, and General Workers' Union.

Representatives of the Municipal Tramways Association and the Tramways and Light Railways Association subsequently met the representatives of the unions, when the latter agreed to postpone the demands, other than those relating to wages, but insisted on immediate attention to the latter.

As the employers felt unable to make any offer in addition to the large increases granted so recently as July last, the unions propose to appeal to the Committee on Production.

FINANCIAL REPORTS AND MEETINGS.

John I. Thornycroft and Company, Limited.—The report for the year ended July 31, 1917, states that the available balance, after deduction of debenture interest and interim dividends, is £102,337. The following dividends have since been paid :—3 per cent. on preference shares for six months to June 30, 1917 ; final dividend of 10 per cent. on ordinary shares, leaving £81,547. The directors transfer to reserve £50,000, contribute to benevolent fund £5,000, and leave to be carried forward £26,547.

Silverton Tramway Company.—The report for the year ended June 30 states that revenue shows a decrease of £29,025 and expenditure a decrease of £25,421, compared with the previous year. Profit and loss account shows :—Balance from working account, £67,315 ; interest on investments, £4,431 ; refund Federal Income Tax Commissioner, £2,559 ; transfer from No. 2 reserve fund, £9,084 ; total £83,389. This was absorbed in payment of dividends, £75,000 interest added to No. 2 reserve fund, £4,431 ; and depreciation, £3,956.

Gloucester Corporation Light Railways.—A statement of the operating expenditure and income for the year ended March 31, prepared by the general manager and engineer (Mr. F. H. Corson), shows a revenue totalling £22,960, including £22,153 for traffic receipts. Operating expenses amounted to £17,385, leaving a gross profit of £5,575. Statistical information includes the following :—Population served, 53,972 ; passengers carried, 4,134,262 ; car miles, 546,172 ; percentage of operating expenses to receipts, 76 ; average operating expenses per car-mile, excluding power cost, 6·48d. ; including power cost, 7·63d.

Camps Bay Tramways.—The report of the Cape Town Consolidated Tramways and Land Company, Limited, for the year ended December 31, 1917, shows a debit balance of £539, against £631 in the previous year. No dividends have been declared by the subsidiary companies. The Camps Bay tramways realised a profit of £3,018 against £2,225 in the previous year. The number of passengers carried showed an increase of 207,236, and the receipts an increase of £3,794, but the cost of operation was £3,001 more. The Cape Town Corporation have completed improvements and other works at Camps Bay which have added to its attractions and increased the number of passengers.

Birmingham Small Arms Company, Limited.—Final dividends on the "A" preference shares at the rate of 5 per cent., on the "B" preference shares at the rate of 6 per cent. (both less income tax), and on the ordinary shares of 5 per cent., together with a bonus of 2s. per share, free of income tax, have been declared. At the annual meeting Sir Hallewell Rogers (chairman of the company), referring to the problem of the utilisation of their facilities after the war, stated that, in association with the Metropolitan Carriage Wagon and Finance Company, they were actively interesting themselves in a line of manufacture forming a "key industry" for which in the past manufacturers had almost been entirely dependent upon importation from other countries.

Exeter Corporation Tramways.—There was a net profit of £1,516 for the year ended March. The total passengers carried were 5,306,562, and the traffic receipts were £20,629, being £463 more than in the previous year. The mileage run was 414,096, being a decrease of 18,964, but 42,662 more passengers were carried. The total working expenses, exclusive of capital charges, were £14,742, an increase of £1,804. Of this, £795 was due to increase of wages. Mr. R. O. Baldwin, the general manager, expresses the opinion that the reserve fund should stand at least at £15,000, instead of £6,849 as at present, in view of the prospect when increased expenditure upon renewals have to be faced. It would be necessary immediately after the war to purchase four new cars at a cost of over £3,000.

Liverpool Corporation Tramways.—At Liverpool Tramways, Electric Power, and Lighting Committee a statement was made by Alderman E. Russell Taylor (chairman) showing the remarkable expansion of business during the nine months to October. Confronted, he said, with many obstacles, restricted by shortage of materials and deprived of a large percentage of employees who had joined H.M. Forces, the management had had to overcome difficulties hitherto unknown in municipal tramway life. The rolling

Digitized by Google

stock, overhead equipment, track and service had been maintained in a manner which reflected credit upon those responsible. The traffic returns for the nine months had exceeded all previous records as regarded total receipts, number of passengers carried, and car-mile earnings. The receipts for 1918 were £705,816, compared with 1917, £603,319, an increase of £102,497; the passengers carried numbered 146,006,029, compared with 127,419,194, an increase of 18,586,835; the mileage was 9,176,861, compared with 9,414,628 a decrease of 237,767; the earnings per mile were 1s. 6·46d., compared with 1s. 3·43d., an increase of 3·03d.

Dick, Kerr and Company, Limited.—The report for the twelve months ended June 30, 1918, shows that this company's prosperity has continued in a way that shareholders should find highly satisfactory. A dividend of 10 per cent. per annum is recommended on the ordinary shares, and £37,860 is carried forward. A year ago the dividend was at the same rate, and £36,073 was carried forward. As in the two preceding years, a sum of £25,000 has been set aside to supplement the special reserve for contingencies. The profits amounted to £87,916, and including the amount brought forward there is a total sum available of £123,989, which has been allocated as set out in the table below, in which a comparison is given with the results of the four preceding years:—

	1918.	1917.	1916.	1915.	1914.
	£	£	£	£	£
Net profits	87,916	95,465	71,740	46,959	44,761
Balance from last year	36,073	20,397	18,347	25,526	10,325
	123,989	115,862	90,087	72,485	55,086
Debenture interest and trustees' fees	9,829	10,188	10,490	10,538	10,961
Premium on debenture stock redeemed	300	300	300	300	300
Dividend on 6 per cent. preference shares	21,000	18,300	18,300	18,300	18,300
Dividend on ordinary shares ...	30,000 (10%)	26,000 (10%)	15,600 (6%)	—	—
Reserve against contingencies ...	25,000	25,000	25,000	25,000	—
Balance carried forward	37,860	36,073	20,397	18,346	25,525

Although the amount of excess profit levy under the Munitions of War Act has not been finally settled, the directors believe that the reserves which they have made in the accounts for extra depreciation, special taxation, etc., are sufficient. All the works have been fully occupied during the year, although in the case of the United Electric Car Company a considerable portion of the time has been occupied in extensions and alterations necessary to produce important work of a nature specially suited to that establishment.

Reading Corporation Tramways.—The report for the year ended March 31 shows that the revenue has considerably expanded, there being an increase in the total income of £11,205. The working expenses increased by over £9,000, but the net profit at £8,400 was £2,700 higher. Of this sum, £4,400 has been placed to reserve and renewals account, and £4,000 was contributed to the borough fund. A comparison of the results for the last four years is appended:—

	1918.	1917.	1916.	1915.
INCOME—	£	£	£	£
Traffic revenue	55,232	43,618	40,097	35,608
Sundry receipts	1,564	973	942	1,074
Total income	56,796	44,591	41,039	36,682
EXPENDITURE—				
Traffic expenses	12,446	9,572	8,884	8,342
General expenses	4,337	3,775	3,791	3,714
Repairs and maintenance ...	9,416	4,756	3,950	4,313
Power expenses	7,197	5,714	4,235	3,643
Total working expenses ...	33,396	23,817	20,860	20,012
War allowances, etc. ...	1,885	2,132	1,682	642
	35,281	25,949	22,542	20,654
Net revenue	21,515	18,642	18,497	16,028
Interest	—	6	48	11
	21,515	18,648	18,545	16,039
DEDUCTIONS—				
Interest, etc.	11,728	11,740	11,753	11,771
Income-tax	1,387	1,185	560	263
Net profit	8,400	5,723	6,232	4,005
Appropriated as follows—				
Borough Fund	4,000	4,000	4,000	3,000
Reserve and renewals	4,400	1,723	2,232	1,005
Mileage of track	13	13	13	13
Car-mileage	920,174	912,258	924,656	924,696
Passengers carried	13,771,598	10,919,533	9,953,906	8,881,097
Units per car-mile	1·52	1·42	1·20	1·15
Ratio of expenses	58·80%	53·41%	50·82%	54·55%
Traffic receipts per car-mile ...	14·40d.	11·47d.	10·40d.	9·24d.
Traffic revenue per mile of single track	£4,192	£3,311	£3,043	£2,704
Expenses per car-mile	8·71d.	6·25d.	5·41d.	5·19d.
Power cost per car-mile	1·88d.	1·50d.	1·09d.	·94d.
Fare per passenger	·96d.	·96d.	·97d.	·96d.
Number of cars in stock	37	37	37	37

Leeds Corporation Tramways.—A statement of the working during the half year ended September 30, has been submitted to the Tramways Committee. The total receipts for the half year were £357,832, or an increase of £60,965 compared with the corresponding half of last year—or more than 20 per cent. It must not, says the *Yorkshire Post*, be assumed that this big sum represents additional net profit, because of the larger sums which have had to go in payment of wages and towards the extra cost of materials. The result is, however, very satisfactory, considering that no fewer than 2,709,202 fewer passengers were carried, and that the cars have run 144,287 miles less, while the receipts per car-mile have advanced by nearly 25 per cent. Comparative figures for the half years ended September 30, 1918, and September 30, 1917, are as follows: Receipts, £357,832, £296,867; miles run 4,729,542, 4,873,829; passengers carried, 59,014,784, 61,723,986; receipts per mile 18·158d., 14·518d.; average fare paid per passenger, 1·434d., 1·133d.; population served 542,000, 542,000; number of times population carried, 108·88, 113·8; average number of cars, 219, 238.

DIVIDENDS.

LIMA LIGHT, POWER, AND TRAMWAYS COMPANY.—A dividend of 1½ per cent. is announced.

SHANGHAI ELECTRIC CONSTRUCTION COMPANY, LIMITED.—An interim dividend has been declared at the rate of 5 per cent. actual, less tax.

BRISBANE ELECTRIC TRAMWAYS INVESTMENT COMPANY, LIMITED.—An interim dividend of 4s. per share, free of tax, has been declared on the ordinary shares.

BARSI LIGHT RAILWAY COMPANY, LIMITED.—A dividend of 6 per cent. has been declared. There has been placed to reserve £1,035 and £11,202 has been carried forward.

BRITISH EMPIRE TRUST COMPANY, LIMITED.—A dividend has been declared on the 5 per cent. cumulative perpetual preference shares for the half year ended October 15, at the rate of 5 per cent. per annum.

LAUNCESTON (TASMANIA) COUNCIL TRAMWAYS.—The report for the year 1916-17 showed revenue £23,138 and working expenses £13,751. The previous year's figures were £21,372 and £13,315. There was a surplus of £631 as against a previous deficit of £45.

SALFORD CORPORATION TRAMWAYS.—For the year ended March 31, during which period over sixty-five million passengers were carried by the cars, an increase of 6,260,000 compared with the preceding year, the total receipts amounted to £348,008, a gross increase of £67,842.

DUMBARTON BURGH AND COUNTY TRAMWAYS.—A dividend of 5 per cent. (1s. per share), less income tax, on the ordinary shares for the year is announced. £6,000 has been placed to reserve, £1,770 to sinking fund for redemption of debenture stock and £2,333 carried forward.

CHEMINS DE FER ECONOMIQUES, BRUSSELS, which controls a system of 172·6 km. in Italy, as well as one of 32·4 km. in Brussels, and participates in many European street railways, has reported a net profit for 1917 of Fr.1,210,534 and has paid a dividend of 5 per cent.

DURBAN CORPORATION TRAMWAYS.—The report for the year ended July 31, 1917, states that the revenue has been £159,254 and the working expenses £99,558. After deducting interest on capital and contributions to sinking and renewals fund there is a net profit of £21,239, and £20,400 has been paid to the borough fund in aid of rates.

Parcels Carrying at Glasgow.—A recent suggestion of the Road Board that, in order to relieve traffic on railways and on petrol-driven vehicles, parcels might be conveyed on tramway cars has been considered by the Glasgow Tramways Committee. The committee recommended by a majority that an experiment be made in carrying parcels by special cars on one of the routes. On the recommendation coming before the Town Council, some discussion took place. Councillor Montgomery (convener of the Tramways Committee) stated that the general manager (Mr. J. Dalrymple) was very anxious that the experiment should be tried. On a motion to disapprove the experiment the voting was equal, 30 on each side. The Lord Provost then gave his casting vote in its favour. It will accordingly be tried.

United States Tramway Fares.—The National War Labour Board has increased by about 40 per cent. the wages paid to the tramway employees. An increase in fares must therefore be made, or a large number of street railways will fail to meet expenses. The award of the National Labour Board entails an increase of about £20,000,000 a year in the wages of street railway employees, and it is estimated that this amount will absorb all the net income and over 50 per cent. of the amount now paid for fixed charges.

The General Electric Company, Limited, has announced that they have completed the purchase of the Erith Works and of the goodwill of the manufacturing business hitherto carried on by Messrs. Fraser and Chalmers, Limited. Practically the whole of the personnel have transferred their services to the General Electric Company, who will carry on the business as a going concern, and under the title of Fraser and Chalmers Engineering Works (Proprietors, the General Electric Company, Limited).

Digitized by Google

MR. R. H. WILKINSON APPOINTED BRADFORD CORPORATION TRAMWAY MANAGER.

Mr. R. H. Wilkinson, late tramways manager and engineer of Huddersfield Corporation, has been appointed general manager of the Bradford Corporation Tramways, at a salary of £800 per annum. Mr. Wilkinson, who has been at Huddersfield for 14 years, was previously manager of the Oldham Corporation Tramways for four years, and had two years' service in the Liverpool Tramways department. His experience has covered mechanical, electrical, and marine engineering. Mr. Wilkinson was one of the pioneers of goods traffic on tramways in this country.

PRESENTATION TO MR. C. J. SPENCER.

Mr. C. J. Spencer, the retiring manager of the Bradford Corporation Tramways, and the newly-appointed manager of the Metropolitan Electric and the London United Tramways, received a farewell presentation from the members of the Bradford Tramways Committee. The presentation was made at a gathering at which there were several speeches expressing warm appreciation for Mr. Spencer and his services as tramways manager for Bradford.

Alderman E. Priestley (chairman of the Tramways Committee), who presided, said that Mr. Spencer was taking a very responsible position in London, and he (Alderman Priestley) believed that there were even higher positions in store for him. It was under the chairmanship of Sir James Hill that the foundation of the Bradford Corporation Tramways undertaking was laid, and he was ably assisted by Mr. Spencer.

Sir James Hill, Bart., M.P., said he had always felt that there was no tramways manager in the country equal to Mr. Spencer, although he did not know his successor. Mr. Spencer's departure was Bradford's loss, but he would leave with the best wishes of everybody in the city.

The Lord Mayor (Mr. H. H. Tetley) expressed the opinion that the choice of Mr. Spencer as tramways manager for Bradford had been amply justified by results.

Other speakers followed, including Councillor I. F. Akeroyd (vice-chairman of the Tramways Committee) and Mr. R. H. Wilkinson, the newly-appointed tramways manager, who said that the tramway world looked upon Mr. Spencer as one of its leading lights.

Subsequently the presentation gift, a silver flower vase, was handed to the recipient by Alderman Priestley, and duly acknowledged by Mr. Spencer.

PERSONAL.

Sir Cyril Jackson, K.B.E., has been appointed chairman of the Committee on Production.

Sergt. T. Dean, formerly a driver on the Leeds Corporation Tramways, has been awarded the Military Medal.

Mr. J. Dobson, manager of the Barrow-in-Furness Tramways, has been appointed manager of Gravesend Tramways.

Councillor J. Timpson (chairman of the Portsmouth Tramways Committee) has been appointed Mayor of Portsmouth.

Mr. G. B. Cooper, general manager of the Wagon Finance Corporation, Limited, has been appointed managing director.

Mr. A. B. Slater, manager of Burton-on-Trent Corporation Tramways, has been granted an increase in salary of £50 and war bonus.

Mr. T. A. Kingham has been appointed acting borough electrical engineer of Kingston-upon-Thames, at a salary of £400 per annum.

Mr. J. R. Groves, manager of the Gravesend and Northfleet Tramways, has been transferred to a similar position at Barrow-in-Furness.

Mr. A. E. Collins has been appointed as the representative of the Institution of Municipal and County Engineers on the Electric Vehicle Committee.

Sir George Gibb, owing to pressure of work in connection with his position as chairman of the Road Board, has retired from the Committee on Production.

Lieut. L. F. Burgess, of the staff of the British Westinghouse Electrical and Manufacturing Company (Australia), has been awarded the Military Cross.

Mr. R. L. McCullough, the late manager of the Carlisle Tramways Company, has been presented by the employees with a piece of silver plate suitably inscribed.

Professor W. B. Dalby, F.R.S., has been appointed on the expert sub-committee of the Gas Traction Committee in place of the late Professor Bertram Hopkinson.

Mr. J. W. B. Brown, first engineering assistant to the borough electrical engineer of Burnley, has been appointed engineer and surveyor to the Failsworth (Manchester) Urban Council.

Mr. J. F. Magoris, acting electrical engineer of Hull Corporation, has been granted an increase in salary from £425 to £700 while carrying out the duties of Mr. H. Bell, who is absent on military service.

Mr. W. P. Durtnall, R.N.V.R., has been granted a temporary commission as staff captain in the R.A.F., and is engaged in the technical department of the chief electrical engineer of the Air Ministry.

Mr. F. Newey, acting electrical engineer to the Swindon Corporation Tramways, is to receive salary at the rate of £275 a year from the date of the retirement of Mr. A. Dimmack, the late electrical engineer.

Mr. A. E. Berriman, chief engineer of the Daimler Company, has been appointed by the Minister of Munitions to be Deputy Controller of the Technical Department of the Department of Aircraft Production, in succession to the late Professor Bertram Hopkinson.

Mr. J. E. Edgcome, borough electrical engineer of Kingston-upon-Thames, who has accepted an appointment as secretary of the Tungsten Lamp Association, has been voted the sum of £500 for his special work in connection with the Kingston power-station.

Second-Lieut. A. W. Godber, R.F.A., who has been wounded in action, was for fifteen years in the Nottingham Corporation Tramways offices. He enlisted at the outbreak of the war, and served for two and a half years in the Egyptian campaign. He recently received his commission.

Mr. A. H. Pott, M.Inst.C.E., M.I.E.E., has resigned the managership of the Metropolitan Electric Tramways, Limited, and London United Tramways, Limited, in order to take up a position under the Tramways (Board of Trade) Committee. The two tramway companies have retained Mr. Pott's services in a consultative capacity.

Mr. W. J. Steele, permanent way engineer to the Newcastle-upon-Tyne Corporation Tramways, has been recommended for an increase in salary. Mr. Steele, who has £1,000 a year as city engineer, was entitled to an advance before he joined the army, but at his own request a previous proposal to advance his salary was dropped.

Mr. C. J. Spencer, who recently resigned the general managership of the Bradford Corporation Tramways to accept an executive position with the London Underground group, has now been appointed manager of the Metropolitan Electric Tramways, Limited, and London United Tramways, Limited. He entered upon his new duties on November 1.

Second Lieut. J. A. Higgins, R.F.A., who was recently wounded in France, and has had to have his left leg amputated from above the knee, is the eldest son of Mr. J. P. Higgins, general manager of the Midland Rubber Company, Limited, Birmingham, and prior to joining the army was a member of the staff of that company. He joined the R.F.A. in September, 1916, receiving his commission in June, 1917, and going to France in September of that year. He was twenty years of age in February.

OBITUARY.

MR. M. E. CURWEN.

We record with deep regret the death of Mr. Maskell E. Curwen, European manager of the J. G. Brill Company, which occurred at Philadelphia on October 1, from pneumonia, after a short illness. Mr. Curwen joined the staff of the J. G. Brill Company more than twenty-five years ago, and has been European manager for more than twenty years with offices in London and Paris. Educated at the Episcopal Academy, Philadelphia, his first years in the car and truck industry gained him an intimacy with the details of manufacture and a practical knowledge of the tramway and railway field, especially of British and Continental practice, which, with his natural capacity for adapting himself to conditions as he found them, made him of value to the foreign customers of his company. His assistance in the early days of electric traction in this country will be specially remembered by many of our readers. He was widely known and esteemed for his upright character, lovable nature, and innate refinement, and his loss is deeply felt by a wide circle of friends on both sides of the Atlantic and by his business associates. Thirteen years ago Mr. Curwen married the daughter of Mr. Charles H. Clark, of New York. His brothers are Messrs. Samuel M. Curwen, George F. Curwen, and John Curwen. Mr. Curwen was a member of the American Society in London and of the American Club in Paris.

The death has occurred from wounds received in action in France of **Second-Lieut. J. Lever, M.C.,** who was formerly a conductor on the South Lancashire Tramways.

The death is recorded of **Mr. W. Clacy May,** who has been acting manager of the Great Eastern Railway in the absence of Mr. H. W. Thornton, general manager. Mr. May had previously been chief traffic manager and goods superintendent.

Second Lieut. E. C. Bracey, of the South Staffordshire Regiment, was killed in action at the age of 33. He had served in the army before the war, and was recalled to the colours in August, 1914, being at that time a conductor on the Dudley, Stourbridge and District Tramways. He had left the army as a corporal, but was promoted to the rank of sergeant on rejoining. He had over three years' service in France, and received the Mons Ribbon After a period in the O.T.C., he was gazetted Second Lieutenant in January, 1918, and left for France in July. He leaves a young widow to mourn his loss.

Digitized by Google

TRAMWAY AND LIGHT RAILWAY NOTES.

BRADFORD.

ACCIDENT CLAIMS.

The claims for compensation arising out of the serious tramway accident at Allerton, a few months ago, have all been settled by the Bradford Tramways Committee. There were altogether 22 claims, and the total amount of the allowances was £1,236 14s., giving an average of between £56 and £57 per claim. Congratulations on the successful completion of their task were extended to the chairman (Alderman E. Priestley), the vice-chairman (Councillor I. F. Akeroyd), the deputy town clerk (Mr. N. L. Fleming), and the late general manager (Mr. C. J. Spencer).

COVENTRY.

KILLED BY A COLLISION.

As a result of a collision between two tramway cars at Coventry, a passenger was thrown against a broken window and so seriously injured in the throat that death took place soon afterwards. At the inquest the jury found that the driver of one of the cars was to blame in leaving undone what he ought to have done, with the result that the death was caused; and that the driver of the other car was also to blame for leaving his points without receiving his signal. The coroner said the verdict amounted to one of manslaughter against the first-mentioned driver, whom he committed for trial at the assizes. He told the other driver he had broken the tramway rules.

DUBLIN.

WAGES AWARD—LAST CARS—FRACTURED ARM.

The arbitration on the claim of the employees of the Dublin United Tramways Company for increased wages has resulted in an award of an increase of 5s. per week from September 1. This increase brings the men's wages to 23s. per week over pre-war rates. Cars which formerly left the centre of Dublin for the suburbs at half-past eleven o'clock at night, now start at eleven o'clock. It is stated that the theatres, music halls, and cinema houses have arranged their programmes to harmonise with the alteration of the tramway service. In the Dublin Recorder's Court £15 15s. damages were awarded against the Dublin United Tramways Company on a claim for £50 in respect of a fractured arm, said to have been caused by a car being pulled up with a jerk.

DUNDEE.

The Dundee Corporation is to supply the Dundee, Broughty Ferry and District Tramways Company with electricity. The arrangements will effect a saving of 1,400 or 1,500 tons of coal per annum. It has been agreed that the company shall pay 1¼d. per unit for their electricity. At present the Corporation is paying 1·6d. per unit, and for the quantity of current which the company requires the Corporation will get £900 per annum more than would otherwise have been received. It is provided that the company close down their power-station, that the Corporation make the necessary connections, that the agreement endure for a year, and that it be terminable by three months' notice from either side.

EDINBURGH.

CORPORATION'S TRAMWAY PREPARATIONS.

Edinburgh Tramways Committee are actively engaged in preparation for the working of the tramways when the lease of the Edinburgh and District Tramways Company expires on June 30. The manager (Mr. R. S. Pilcher) has been instructed to report on the question of fares at an early date, taking into consideration a suggestion for the adoption of a universal fare for all continuous journeys of any distance with transfers in certain cases. Detailed arrangements are also being made for the taking over of the tramways and the establishment of a tramways department with the necessary staff. The committee have recommended the Corporation to join the Municipal Tramways Association.

GLASGOW.

ROLLING STOCK—REDUCTION IN MILEAGE.

Glasgow Corporation Tramways now have 824 top-covered cars, 30 single-deck bogie cars, and one training car. Seven converted horse cars are still in use, making up the total to 862 cars. Vestibules have been fitted to 386 cars. The average number of cars in use daily (14-hour day) is 685. The total cost of inspection and repair of cars at the depots and car works during the last financial year was £69,731, and a further sum of £27,908 was charged against revenue to meet depreciation. The Tramways Committee is reducing the car mileage in order to economise fuel. In a recent week the reduction amounted to 30,000 miles as compared with the corresponding week a year ago, when the car mileage was 508,519. In spite of the reduced service the receipts showed an increase of £1,333.

LEEDS.

TRAMWAY PROJECTS—PARCELS SERVICE.

Leeds Tramways Committee are considering projects for facilitating higher speeds and for a still better service throughout the entire system after the war. They have also before them the question of transit to and from the districts in regard to which housing and town planning schemes are proposed, and of plans for the extensions which are in contemplation. It is proposed to obtain powers for the construction of a tramway through the Hawksworth Wood Estate and from Dewsbury Road to the new Middleton town planning site. Powers are also to be sought for an omnibus service from Dewsbury Road and Hunslet to the same site. The recently established parcels service is being extended by co-operation with the similar service of some years' standing worked on the Bradford Corporation Tramways.

NEWCASTLE-ON-TYNE.

MAGNETIC BRAKE NOT APPLIED.

At an inquest at Newcastle-upon-Tyne upon a woman who died from injuries received through being alarmed and jumping from a runaway tramway car, the jury expressed the view that the accident might have been averted had the motorman, instead of allowing the power to remain on, shut it off and applied the magnetic brake.

PORTSMOUTH.

BARRIERS AND GANGWAYS.

Portsmouth Tramways Committee has approved a scheme, submitted by Mr. W. R. Spaven (general manager), under which barriers and gangways are to be placed at certain centres, with a view to the better regulation of passengers' access to the cars.

SHEFFIELD.

DAMAGES FOR DAMAGED CAR.

Sheffield Corporation obtained judgment in the County Court for £18 7s. 4d., damages sustained owing to the negligent driving of a steam lorry. It appeared that the driver of the lorry attempted to cross the road in front of a car while the latter was in motion, and as a result of the collision which followed the glass front of the vestibule was smashed.

ST. HELENS.

EXTENSION OF TRAMWAY LEASE.

St. Helens Town Council have decided to negotiate with the New St. Helens and District Tramways Company for an extension of the lease to the company for a period not exceeding five years. The lease of 21 years expires in October, 1919.

WIGAN.

FATAL FALL FROM PLATFORM.

While riding on the front platform of an overcrowded tramway car at Wigan, a young woman fell into the roadway, owing to a jerk of the car, and was killed. At the inquest it was stated that there were six passengers on the platform with the driver. The coroner expressed the opinion that people should not be allowed to stand on the front platform of a car.

WREXHAM.

RIDING ON THE STEPS.

When two cars collided at the join of a loop on a tramway line near Wrexham, two men who had been riding on the steps near the driver of one of the cars were pinned between the two cars. One man had a finger severed and other fingers of the same hand fractured; the other had a foot badly crushed.

TROLLEY HEAD SLINGS

Trolley Head Slings 18" long by 3/16" diameter. Best Flexible Steel Wire Rope Galvanised, Loop-spliced in each end to take ½" bolt, and served with Galvanised Wire. Price 12/- per dozen nett (in Gross Lots). Sample on Application.

C. OSBORNE, 97 South Street, Longsight, MANCHESTER

ENGINEERING firm with up-to-date plant and special facilities for turning out repetition work, are prepared to consider the manufacturing rights of patented specialities for sale amongst tramway and electrical undertakings.

Box No. 58, The Tramway and Railway World, Amberley House, Norfolk Street, London W.C.2

Digitized by Google

PATENT LIST.

Abstracted for "The Tramway and Railway World" from the Official Journal of Patents.

***** If the inventions have been communicated the names of the communicators are given in italics.**

APPLICATIONS FOR LETTERS PATENT.

The number of the patent is given in brackets.

Apparatus for controlling railway trains or vehicles (15,863)—A. R. Angus.
Railroad tracks, etc. (15,873)—L. Denonvilliers.
Motor omnibus, tramway car, etc. (16,014)—J. Hardy.
Jacking arrangements for automobiles (15,882)—A. H. F. Hern.
Variable speed gear (16,084)—T. J. Heskett.
Mounting for automobile engines (15,974)—A. S. Hordern.
Railway chairs (16,214)—D. John.
Brakes and brake mechanism of power-propelled vehicles (16,082)—F. W. Lanchester.
Speed regulating devices (15,917)—L. M. Robinson.
Gas producers for propelling vehicles (15,900)—D. J. Smith.
Carburettors of internal combustion engines for motor vehicles (16,106)—C. E. Thorne.
Steering wheels of motor cars, etc. (15,925)—W. Waller.
Tramway track (16,490)—T. Bowen and B. Insley.
Trolley guide for electric tramway cars (16,546)—C. E. Brand.
Method of gear changing in motor vehicles (16,274)—H. Dorrington.
Locating device for overhead electrical supply wires for tramway cars or locomotives (16,268)—J. C. M. Madagan.
Lubricant (16,314)—F. L. Schauermann.

STEAM AND HYDRAULIC
ENGINE PACKING
MANUFACTURERS
(Flax, Asbestos and Cotton)
And all Engine Room Stores
ATTWATER & SONS
Hopwood Street Mills, PRESTON
Telegraphic Address: "Attwaters, Preston."

STEAM CONDENSING PLANT.
VACUUM PUMPS AND EVAPORATORS.
MIRRLEES WATSON
THE MIRRLEES WATSON CO. LTD., GLASGOW

'TRIPLEX' SAFETY GLASS
The Only Glass that cannot Splinter. A vital necessity for all purposes where perfect vision and absolute safety are essential. Catalogue free.
THE
'Triplex' Safety Glass Co. Ltd.
(Reginald Delpech, Managing Director)
ALBEMARLE STREET, LONDON W.1
CONTRACTORS TO H.M. GOVERNMENT

Trolley shoes (16,593)—L. H. Shipman.
Three-speed gears (16,253)—W. Wilkie.
Speed indicators (16,824)—L. E. Cowey.
Devices for coupling vehicles (16,756)—C. N. Goodall.
Joint sleeper for fastening two rails without fish plates (16,874)—B. N. Jones.
Variable speed gear (16,747)—A. G. McKenzie.
Electric safety signal for motor vehicles (17,084)—S. Springer and F. van den Wyngaert.
Portable turntable for motor vehicles (16,958)—A. H. Steggall.
Bearings or mountings for steering wheels of motor vehicles (17,115)—W. J. Thomas and E. G. Wrigley and Company.
Apparatus for locking and detecting railway switch points, etc. (16,925)—J. P. O'Donnell (*R. J. E. Thurburn*).
Transmission mechanism for motor vehicles (17,116)—F. G. Woollard and E. G. Wrigley and Company.
Steering gauge for automobiles (17,415)—W. Bicknell.
High-speed electric, etc., locomotives (17,316)—British Thomson-Houston Company and F. W. Carter.
Axial flow steam turbines (17,267)—British Westinghouse Electric and Manufacturing Company, and K. Baumann.
Detachable wheels for motor vehicles (17,516)—A. G. Fenn.
Differential gear for motor vehicles (17,479)—A. Franks.
Variable speed mechanism (17,480)—H. J. Greaves.
Six-wheeled motor vehicles (17,265)—C. F. Gros.
Variable speed gear (17,285)—T. J. Heskett.
Signalling danger to vehicles at road junctions (17,427)—S. Horton and R. W. Willets.
Life guard (17,487)—S. D. Le Pipre.
Warning device for use with motor vehicles (17,202)—A. C. Robinson.
Steering gauge for automobiles (17,415)—J. Steele.
Cooling arrangements for motor vehicles (17,161)—T. Thornycroft and J. I. Thornycroft and Company.

SPECIFICATIONS PUBLISHED.

1917.

Points or switches for tramways (5,261—*118,645*)—R. A. Hadfield.
Storage systems for the supply of gas to internal combustion engines (12,542—*118,661*)—G. J. Shave and London General Omnibus Company.
Clutch driving mechanism (12,563—*118,662*)—O. B. Graham and H. Weilding.
Disposition of engine and transmission gear and constructional details in motor vehicles (12,639—*118,670*)—L. S. Girling.
Carburetting apparatus for automobile engines (13,149—*110,542*)—Soc. Lorraine des Anciens Etablissements de Dietrich et Cie de Luneville.
Electrical transmission arrangements for motor vehicles (13,741—*118,699*)—W. A. Stevens and J. Sankey and Sons.
Gas containers for motor vehicles (15,259—*118,723*)—C. O. Uner.
Brake and clutch mechanism of locomotives and railway motor cars (15,500—*118,728*)—Baguley Cars, Limited, and L. Bentall.
Springing of motor vehicles (15,936—*118,731*)—A. W. Smyth.
Elevated railways and tramways (16,184—*118,734*)—S. A. Rogers.
Spring motors for spring starters for automobile engines (18,534—*118,760*)—P. C. Lindgren.
Motor-driven road vehicles (13,489—*118,894*)—London and Westminster Industrial Syndicate and H. B. Molesworth.
Permanent way (13,530—*118,897*)—E. A. W. Phillips.
Brakes for motor road vehicles (14,535—*118,916*)—E. L. Cornell.
Change speed gears (15,232—*118,929*)—G. Von Zweigbergk.
Jacks (18,681—*118,963*)—R. A. Smith and Smith and Sons.
Variable speed gear mechanism (13,838—*119,098*)—T. A. N. Leadbetter, A. L. K. Gilchrist, and W. H. Tate.
Brakes for motor cars (13,689—*109,972*)—C. W. Kuijper.
Spring suspensions for motor vehicles (13,959—*119,285*)—S. L. C. Coleman.
Jacking apparatus for motor vehicles (16,884—*119,335*)—E. Graham and G. Bowman.
Automatic braking device for compensation gears of automobiles (19,255—*119,363*)—H. Bilgram.

1918.

Electric starting apparatus for motor vehicle engines (615—*118,775*)—H. Lucas and C. L. Breeden.
Trolley heads for electric traction (7,905—*118,822*)—J. B. Parker and J. Smith.
Devices for controlling speed of automobile vehicles (6,491—*119,006*)—A. Gaillard.
Fluid pressure operated points and signals (1,246—*112,945*)—McKenzie, Holland and Westinghouse Power Signal Company.
Railway chair keys and wedges (1,771—*119,176*)—E. Gething.
Electrically-propelled road vehicles (4,342—*119,192*)—Edison Accumulators, Limited, and J. F. Monnot.
Apparatus for staff and tablet systems for controlling traffic on railways (10,865—*119,214*)—Tyer and Company and F. W. Leake.
Rail joints (5,553—*119,409*)—J. A. Hyle and C. H. Nelson.
Rail joints (8,836—*119,425*)—H. T. Goddin.
Fluid pressure braking apparatus (12,148—*119,437*)—W. V. Turner.

Digitized by Google

TRAFFIC RETURNS.

Tramway and Omnibus Undertakings in the United Kingdom.

NAME OF COMPANY OR CORPORATION.	1917. WEEKS ENDED.					1918. WEEKS ENDED.					AGGREGATE.		
	Oct. 6.	Oct. 13.	Oct. 20.	Oct. 27.		Oct. 5.	Oct. 12.	Oct. 19.	Oct. 26.		Wks.	1918.	Increase or Decrease.
	£	£	£	£	£	£	£	£	£	£		£	£
Aberdare U.D. Council	437	434	467	423	...	511	506	519	483	...	30	15,168	—
Aberdeen Corporation	2,083	2,040	2,030	1,955	...	2,603	2,567	2,483	2,303	...	21	55,957	+ 9.858
Ayr Corporation	504	338	338	327	...	551	430	407	382	...	23	16,882	+ 3.707
Belfast City	...	...	...	...	...	...	...	...	...	...	—	—	—
Birkenhead Corporation	1,746	1,777	1,810	1,793	...	2,245	2,187	2,164	2,100	...	30	66,766	+ 11189
Blackburn Corporation	1,549	1,387	1,387	1,358	...	1,691	1,598	1,797	1,931	...	30½	56,633	+ 10,321
Bradford Corporation	7,902	7,094	9,084	7,331	...	9,693	10,534	9,830	9,438	...	30	280,358	+ 46,283
Burnley Corporation...	2,099	1,837	1,838	1,810	...	2,370	2,376	2,355	2,670	...	—	—	—
Burton-on-Trent Corporation ...	341	325	315	319	...	421	416	406	366	...	30	12,496	+ 3,151
Bury Corporation	1,656	1,579	1,566	1,483	...	2,011	2,076	1,991	2,109	...	30	63,020	+ 11.896
Chatham and District	1,050	1,176	1,209	1,113	...	1,282	1,302	1,301	1,215	...	43	55,767	+ 347
Cork Electric	632	576	567	566	...	594	588	564	573	...	43	26,646	+ 2.942
Derby Corporation	1,280	1,223	1,211	1,251	...	1,486	1,514	1,498	1,485	...	30	45,751	+ 9.119
Dundee City	1,641	1,506	1,508	1,488	...	1,979	1,928	1,919	1,873	...	23	45,336	+ 9.186
East Ham Corporation	1,238	1,292	1,357	1,267	...	1,543	1,684	1,686	1,452	...	29½	46,801	+ 4,227
Glasgow Corporation	27,295	26,341	26,939	26,185	...	29,926	27,792	28,272	28,434	...	21½	610,240	+ 50,512
Glossop (Urban Elec. Supply Co.)...	177	171	166	168	...	168	174	167	171	...	43	7,777	+ 1,181
Halifax Corporation	2,587	2,273	2,309	2,311	...	2,862	2,778	2,965	2,856	...	29½	84,979	+ 9,536
Halifax Corp. Motor Omnibuses ...	54	50	53	48	...	71	70	75	68	...	29½	1,984	+ 538
Huddersfield Corporation	3,376	2,996	3,173	3,032	...	3,689	3,779	3,775	3,666	...	30	109,675	+ 14,088
Ilford U.D. Council	...	...	...	...	...	...	...	...	...	...	—	—	—
Ipswich Corporation	708	670	663	641	...	715	720	662	613	...	30	24,024	+ 2,723
Isle of Thanet	155	195	206	157	...	269	333	321	300	...	3½	1,223	+ 510
Kilmarnock Corporation	200	200	206	203	...	267	261	252	259	...	23½	6,028	+ 1,347
Lanarkshire	2,974	2,883	2,980	2,958	...	4,065	3,488	3,666	3,618	...	43	152,940	+ 34,027
Lancashire United	...	...	...	...	...	...	...	...	...	...	—	—	—
Leeds City	11,639	10,520	11,023	10,785	...	14,392	14,367	14,435	13,617	...	30	405,177	+ 73,658
Leicester Corporation	4,068	3,904	3,841	3,849	...	4,675	4,775	4,559	4,213	...	—	—	—
Leyton U.D. Council	1,696	1,694	1,814	1,728	...	2,438	2,526	2,442	2,209	...	30	70,378	+ 12,481
Liverpool Corporation	16,843	16,213	15,915	15,925	...	19,155	19,181	19,098	18,751	...	42½	777,228	+ 113,057
Llandudno and Colwyn Bay ...	371	321	290	270	...	432	346	333	296	...	47	21,864	+ 5.009
London County Council	52.507	52.652	55.515	53.980	...	67,387	68.883	68,975	63.493	...	29½	1.927,915	+ 280.945
Maidstone Corporation	297	226	229	215	...	360	261	269	237	...	29½	8.706	+ 1.174
Manchester Corporation	21.881	20,474	21.002	20.793	...	27,526	27,677	28.107	27.291	...	30	781 582	+ 160.449
Newcastle-on-Tyne Corporation ...	8.222	7,931	8,122	...	...	9,447	9.295	9.250	...	...	28	266.633	+ 40.603
New St. Helens and District ...	...	...	...	...	...	...	...	...	...	...	—	—	—
Northampton Corporation	898	820	836	865	...	827	813	813	782	...	30	25,892	+ 652
Nottingham Corporation	4,711	4,546	4,639	4,445	...	5,723	5,725	5,873	5,700	...	30	173,888	+ 41.606
Oldham Corporation	2.839	2,840	2,690	2,650	...	3,407	3,669	3,488	3,490	...	31	109,197	+ 20.343
Reading Corporation	1.222	1,121	1,088	1,086	...	1,291	1,296	1,319	1,223	...	29½	39,893	—
Rhondda Tramways	1.675	1,554	1,659	1,579	...	2,015	1,975	2,034	1,974	...	43	76,330	— 13.121
Rotherham Corporation	1.801	1,859	1,814	1,837	...	2,593	2,591	2,508	2,392	...	29½	72,200	+ 17,197
Sheffield Corporation	12.211	12,218	11.921	12,199	...	13,841	13,852	13.505	13,097	...	30½	417,326	+ 47.418
Southampton Corporation	2.323	2,143	2.269	2,144	...	2,475	2,452	2,409	2,358	...	29½	76.676	+ 15.577
Southend-on-Sea Corporation ...	622	592	645	622	...	1.230	1,140	1,042	974	...	30	42.737	+ 12.715
South Shields Corporation... ...	965	924	926	...	...	1.165	1.154	1.121	...	...	29	34,219	+ 6,444
Sunderland Corporation	1.820	1.873	1.831	1,830	...	2.189	2.348	2.283	2.280	...	30	64,287	+ 8.995
Swindon Corporation	296	265	266	258	...	300	301	303	284	...	29½	9.147	— 977
Torquay Tramways	878	772	692	706	...	901	826	812	754	...	43	39,902	+ 11.185
Tyneside Tramways and Tramroads	...	...	...	...	...	...	...	...	...	...	—	—	—
Wallasey Corporation	1,594	1,470	1,455	1,420	...	1,673	1.681	1,642	1,554	...	29½	58,109	+ 8.823
Walsall Corporation	1.036	1,002	1,022	990	...	1.221	1.267	1,301	1,255	...	30	37.250	+ 7.803
Walthamstow U.D. Council ...	1,093	1,076	1,113	1,070	...	1.345	1,407	1.375	1.241	...	30	44.328	+ 6,382
Warrington Corporation	592	580	567	...	...	813	803	807	...	...	29	21,760	+ 6,192
West Ham Corporation	3.252	3.359	3,611	3,412	...	4,740	4,683	4.524	4,232	...	29½	134.972	+ 24.624
Wigan Corporation	2,072	2,001	2.113	2,311	...	2,676	2,609	2,639	2,788	...	30	71,524	+ 12,367

*** A number of undertakings have suspended the issue of traffic returns for the duration of the war.

Colonial and Foreign Tramway Traffic Returns.

NAME OF COMPANY.	1917. WEEKS ENDED.					1918. WEEKS ENDED.					AGGREGATE.		
	Oct. 6.	Oct. 13.	Oct. 20.	Oct. 27.		Oct. 5.	Oct. 12.	Oct. 19.	Oct. 26.		Wks.	1918.	Increase or Decrease.
	£	£	£	£	£	£	£	£	£	£		£	£
Anglo-Argentine	55.070	53,666	53,113	53,732	...	61,188	58.790	55.070	48.534	...	43	2.394.125	+ 175.884
Calcutta ... ... Rs.	70,844	70,274	71.770	66,955	...	83,099	79.939	73.289	67,401	...	43	30,548,551	+ 267.129
Madras ... ... Rs.	...	(2 weeks)	36.385	...	...	...	(2 weeks)	39.924	...	...	40	757.888	+ 97,091
Pernambuco	4,366	4,279	4,259	4.194	...	4,211	4,983	3,101	3,524	...	43	186,390	+ 23.220

Companies Issuing Monthly Statements only.

	1917.						1918.						Wks.	AGGREGATE.	
	May.	June.	July.	Aug.	Sept.	Oct.	May.	June.	July.	Aug.	Sept.	Oct.		1918.	+ or −.
	£	£	£	£	£	£	£	£	£	£	£	£		£	£
Ballarat & Bendigo	2,877	2,811	2,563	2,766	...	...	3,287	3.075	2,948	2,996	...	...	20	16,400	+ 845
Brazilian Trac. Mlrs.	7864000	7642000	7795000	8064000	...	...	9030000	9087000	9465000	9491000	...	...	34	68,649,000	+8.144,000
Brisbane	33,340	32,475	32,720	36,925	31,600	...	37,610	36.245	36,360	42,670	35,400	...	39	325,854	+ 31.014
British Columbia $	438,919	373,029	438,378	454,425	457,709	...	486,876	488.873	413,968	544,339	575,476	...	13	1,533,783	+ 183.271
Buenos Ayres L'c'z.	40,595	38,020	38,063	39,111	33,655	39,067	41.315	38,375	41,145	41.817	41,006	41,843	17	165,812	+ 13.915
Burma	24,906	25,463	26.288	26,714	26,167	...	29.019	31.158	34,848	41.855	30.836	...	8	72.691	+ 43,123
Cape Town	...	...	16,067	15.480	...	...	...	17,612	18,409	19,055	17,872	...	13	55,336	+ —
Carthagena & H. ...	4,321	5,325	5,763	4,164	4,306	2,805	5,027	5,047	5,491	2,729	2,549	2,525	43	40,926	— 284
Cordoba	13,735	...	...	...	...	...	15,649	...	...	...	...	...	8	30,448	+ 3,053
East India	1,455	1,186	1,183	1,562	1,512	1,229	1.920	1.754	1,968	1,975	1,939	2,044	13	5,958	+ 1.655
Kalgoorlie	2,692	2,648	...	...	...	...	2.767	2.747	...	...	...	...	26	15,985	+ 544
La Plata	4,127	3,852	3,876	4,075	3,450	4,070	5,105	5,134	6,722	4,382	4,999	5.177	42	51.492	+ 10,876
Lima	35,336	28,557	37,731	38,424	...	...	42,881	42.129	45,974	44,711	...	...	34	346,807	+ 60.250
Manaos ... Rs.	158.613	...	...	...	...	...	153,132	...	...	...	...	...	21	741,459	— 16.679
Manila ... $	61,500	...	...	...	...	...	93,500	...	...	...	...	...	21	367.500	+ 100.060
Monte Video ...	28,716	27,458	28,597	28,860	29,426	...	32.301	30,503	31,684	16,937	29,611	...	47	347.073	+ 17.394
Peruvian ... $	902.780	965,420	975,000	979.430	950,740	1047220	1022120	1099470	987,300	1029610	957,910	1090815	17	4.065,635	+ 113,245
Port Elizabeth ...	3,494	...	3.544	3.360	...	...	...	5,404	3,395	3,725	3,661	...	13	10.781	+ —
Rangoon	4,737	4,383	4,783	4,788	5,163	...	5,719	6.163	6,055	5.760	6.067	...	39	52.627	+ 8,272
Toronto ... $	992,460	984.529	954,192	1039819	1023517	...	1090747	1035932	1049936	1070567	1119925	...	39	9.596.597	+ 705.485
Winnipeg ... $	259,794	254,226	242,797	248,457	267,170	...	280,935	293,140	288,155	288,974	285,670	...	39	2.674.137	+ 242,343

Digitized by Google

A 2-ton Daimler Lorry owned by
Messrs. Galloways Ltd., Manchester
The hilly nature of the roads in the North of England provides scope for the Daimler Sleeve-Valve Engine to demonstrate its wonderful power and flexibility.

"What Lancashire thinks to-day England thinks to-morrow" has a meaning outside the question of politics.

The heavy conditions of service in Lancashire quickly pull to pieces less robust machines than the Daimler Lorry. What satisfies the experienced user in Lancashire should therefore give equal or better service in other parts of the Country, AND IT DOES.

In Lancashire, the Daimler Lorry is proving its superiority. Owners in Liverpool include :—Lever Bros., John Jones & Sons, and W. Hunt & Co. In Manchester :—The Corporation Bus Service employs Daimlers entirely, amongst other users being J. Mandleberg & Co., Galloways Ltd., and E. Marsden & Son. In Burnley :—Lockwood & Buckley, and William Heaton & Sons use Daimlers. At Heywood, Healy Bros. ; at Blackburn, John Fish, Ltd. ; Accrington, Entwistle & Kenyon—mentioning but a few well-known Companies. The majority of these concerns have further Daimler Vehicles on order for after-war delivery.

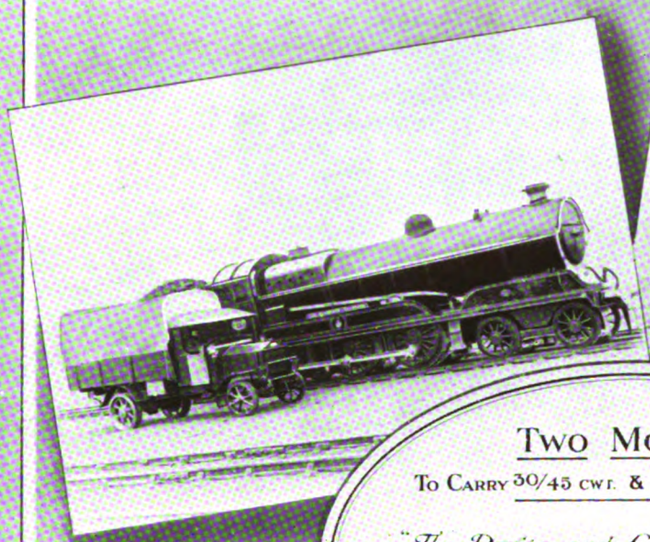
Follow their example and send your enquiry for particulars, when available, of the models we shall market when our war work is done. In the meantime examine the merits of the Daimler Sleeve-Valve Engine. *Particulars on request.*

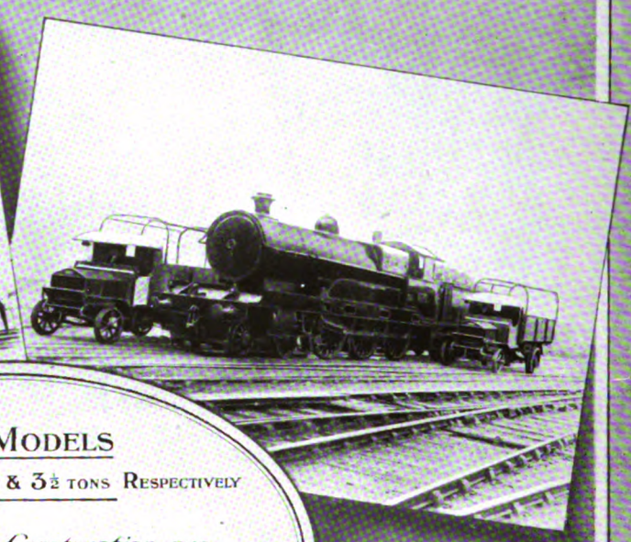
The Daimler Company Ltd. Coventry

Digitized by Google

NAPIER

MOTOR VEHICLES.





TWO MODELS

TO CARRY 30/45 CWT. & 3½ TONS RESPECTIVELY

"The Design and Construction are Throughout of a Character, which it would be Exceedingly Difficult, if not Impossible, to Improve Upon."

RAILWAY GAZETTE, MARCH 31, 1916.

IN PEACE

USED BY THE LARGEST CARRYING COMPANIES AND COMMERCIAL HOUSES.

IN WAR

USED BY THE BRITISH AND ALLIED GOVERNMENTS.

D·NAPIER & SON LTD

WORKS
ACTON, LONDON.
W

14, NEW BURLINGTON ST. LONDON. W.

Digitized by Google

ALCOHOL AS MOTOR FUEL.

The past month has brought us a step nearer to the long-deferred investigation of alcohol as a motor fuel. A Committee, more or less departmental in character, but not lacking in the scientific element, has been formed by Mr. Walter Long, acting through the Petroleum Executive. Sir Boverton Redwood, the Director of Research of that body, will act as chairman of the Committee. Most of the Government departments conceivably concerned in the production or use of alcohol fuel are officially represented on the Committee, but curiously enough the list includes no representative of the Colonial Office. For the rest, the composition of the Committee includes certain distinguished scientific men known to be well informed upon the subject and a recognition of the endeavours of the unofficial Alcohol Fuel Committee, which was formed before the war, but the work of which was necessarily discontinued for lack of funds when the war broke out. We are glad that the Government has gone so far as to sanction the formation of a Committee such as that just described. It remains to be seen, however, what treatment the Committee will receive when it gets to the inevitable point of requiring funds for the purpose of scientific investigations. In certain directions its investigations may be facilitated or assisted by the motor industry, probably acting through the Research Association to which we referred last month. It is not to be expected, however, that the motor industry will go so far afield as to investigate the sources of production of alcohol or the various processes of distillation and denaturing. It will probably show itself willing to conduct experiments as to the design of engines suited to use alcohol alone or as a very high proportion of a mixed fuel. This is the most that can be expected of it. Such experiments are very necessary but are hardly as essential as those which will cover the subjects of distillation and denaturing. Possibly a special grant may be made to the Committee for this side of the work. If not, we are afraid that the whole movement, even though it has the strength of at least a semi-official organisation, must necessarily fail in its main object.

AUCTIONS OF MOTOR VEHICLES.

Another event of the past month, of minor importance in itself but very significant if it is to be taken as a precedent, was a public auction of a certain number of vehicles rejected from military service. Long ago we expressed the view that great care is needed to frame a satisfactory scheme for disposing of surplus Government vehicles; and it is to be hoped that this auction is not the logical outcome of the very lengthy deliberations of the Surplus Government Property Disposal Board. If so, the Board cannot be congratulated on the originality or efficacy of its solution of an extremely important problem. At the present moment, repairing facilities are very inadequate. Motor manufacturers are definitely disqualified by Government contract work from undertaking the repair of their own vehicles. The motor user who buys an auctioned vehicle, directly or indirectly, therefore takes very considerable risks. These may be unavoidable at the moment, but the taking of such risks will be inexcusable directly a supply of new vehicles becomes available. At that time, the auctioning system, if continued, will, we feel sure, prove a lamentable failure from the point of view of the Government, even if the Government's object is simply and solely to obtain the highest possible prices. Equally, it is not in the interests of the motor user that vehicles should be sold in this way without being previously repaired and overhauled by some responsible person whose guarantee of their condition after overhaul would be of real value. From the standpoint of the motor manufacturer, the auctioning system is entirely vicious. It jeopardises his goodwill by spreading broadcast vehicles originally of his make, but for the condition of which he cannot reasonably be held responsible. Also, it lets the pure speculator in as a motor dealer on a big scale and leaves the manufacturer quite incapable of estimating, however roughly, the probable demand for new vehicles, and therefore the extent to which he can retain labour in employment when the war is over. The auction to which we have referred was a trivial affair. In itself its influence was negligible and, if it only represents a stop-gap method to be applied until the number of vehicles becomes considerable and a better scheme has been perfected, there is nothing very much to be said against it or for it. If it is intended as the precursor of a number of auctions on a far bigger scale, it represents to our mind an example of official stupidity which would be hard to beat.

ELECTRIC ENGINE STARTERS.

Some doubts have been expressed as to the probability of electric engine starters coming into general use on private motor cars. Our own opinion is that the question is not worth argument. It will be decided

Digitized by Google

MOTOR TRAFFIC

largely by foreign competition, which will compel the starting motor to be fitted on practically every privately owned motor vehicle. There is a fair likelihood that it will also come to figure as a standard fitting on public service vehicles, or at least on a fair percentage of them. Its disadvantage is, of course, its first cost. Its advantage is that it saves manual labour and time in starting up and discourages drivers from falling back upon extemporised starting devices injurious to their engines or vehicles. It is still more likely that starting motors will be fitted on a fair number of light delivery vans which require to stop very frequently at short intervals in order to effect deliveries. Without a starting motor, the engine is invariably left running and the total amount of fuel wastefully consumed in this way must be very considerable, and in many instances must more than balance the depreciation of a starting motor and the interest on its first cost.

AMERICA'S WAR VEHICLES.

ORDERS FOR FOUR TRUCK AND THREE PASSENGER MODELS.

At the end of July 75,000 trucks and passenger cars had been ordered for war work by the United States army. The trucks are of classes AA, A, B, and TT. The latter, of which official announcement of adoption was made on July 25, is a four-wheel drive type designed by the Engineering Ordnance Department in reply to a request from General Pershing, who stated that the heavy trucks hitherto used in France were not satisfactory. The TT truck (says the *Commercial Vehicle*, of New York) is especially suitable for hauling large guns over rough country and has the ability of a tank to go over places generally considered impassable to other vehicles.

The AA truck, which is the General Motor Company's ¾-ton model, was decided upon because of its low fuel consumption and light weight. The principal change from the regular model is a superior spring development needed because this model is to be used not only for stores but as a heavy ambulance also. Seven thousand five hundred of these trucks are being ordered from various factories.

The Class A truck, which is the White 1½-ton truck with some changes, was selected after tests of many commercial trucks. It was adopted according to the Motor Transport Service because of lower gasoline and oil consumption, more satisfactory performance both in Mexico and France, high speed work with pneumatic tires and the low cost of spare parts. Class A is to be used for staff observation, reconnaissance and as a high-speed truck.

One of the principal reasons for retaining the Class B 3-ton model originally known as the Liberty truck, says the Motor Transport Service, is its maintenance. Eighteen thousand have been ordered. Its cost is less than that of any other commercial trucks of the same capacity.

The Class B truck has given satisfactory service following a test of 15,000 miles, and was found to have greater strength, more power, and to be better suited to rough roads. This truck will operate in a zone of fire. More than 6,000 of the Class B 3-ton standard army trucks had been delivered at the end of July. They are produced at the rate of 75 a day. The original programme called for the production of 10,000 by August 1, but a delay in the delivery of engines and axles prevented completion of the programme as planned. The delivery of the first 10,000, it is anticipated, will be completed by September 15.

In rejecting many trucks under test the Motor Transport Service states that the rejections were in no way reflections on their commercial value. The majority were made for city work and could not be expected to do the exceptionally heavy rough work required in France.

The Ford passenger chassis, following the request of the American Expeditionary Forces, has been adopted as a standard chassis for use as a passenger car, light ambulance, light truck, and so forth. There are now 3,000 Ford ambulances in use in France, and the number will soon be increased to 8,000. The Ford Motor Company are working on an order for 5,000 light delivery trucks, production of which began July 22 at the rate of 200 per day. The principal reasons for the wider use of the Ford are the ease of repairing, cheapness of operation, large production, and the extremely low initial cost and the fact "that it can be used where many other passenger cars cannot."

The other two types of passenger cars tested and selected are the Dodge and the Cardillac. These are the regular models with additions and deductions, and will be produced in other factories if the needs of the Government require it.

ITALIAN AUTOCAR SERVICES.

An article on autocar traffic in Italy appears in the *Rivista Technica delle Ferrovie Italiane*. Italy is backward in the matter of general transport but sufficient progress has been made in the adoption of motor transport and in autocar production to enable one to say that the industry is now a great one. The Fiat Company is exceptional in the great production and fine quality of its products. In the year 1900 the Fiat works were turning out three chassis per day. In 1910, when the Lybian war began, the company was producing 12 to 13; and the daily production now is sixty. The Spa Company came into being shortly after the Fiat, and is producing 6,000 chassis per annum. This firm won the trials for the postal services in 1907. There are other good firms, such as Devecchia, Bianchi, Isotta, Fraschini, Zust, Lancia, Aquila, Diatto-Clement, Fiat-Ansaldo Italia, *Z. Scat*, and Storero. These have all intensified their production. Their great activity has given rise also to a large industry in the manufacture of accessories; and it is estimated that the annual turnover of capital owing to this industry is about a milliard of lire. The article is illustrated with many pictures of cars produced in Italy, including goods cars of 35 H.P. made by the Spa house.

Of war types of cars those of 15–20 H.P. and 25–30 H.P. are much in use, and the Italians have every reason to be proud of the success that has followed their productions. Ammunition supplies from the railways to the front are effected entirely by means of these cars. The 15–20 H.P. machines do 40–60 kilometres per hour. Searchlight projector cars and gun-carrying cars are also produced in the Italian workshops.

Dealing with the question of novelty or invention, the article says that the various houses are approaching each other in the matter of uniformity of type. A recent novelty is the motor plough, which has been rendered necessary by the imperative call of agriculture. One of the most interesting novelties in Italy is the automatic starter, and the tendency has become general to light the cars with auto-generated electricity.

Public motor services have grown considerably. It was only in 1908 that the Post Office began to use autocars. On the other hand the war, whilst stimulating the production of the military car, has greatly curtailed the manufacture of the ordinary car; materials, etc., are very expensive. Still the public services grow in importance and extent; and there are now routes comprising about 16,000 kilometres being served with automobiles. The journal is in favour of a well-considered subsidy scheme for autocar lines, to be modified from year to year if occasion offers. The list of autocar lines in existence in 1917 is given as 421 in number, with others to be added. The list has been difficult to prepare for services are constantly disappearing; and others suddenly come into operation.

ALCOHOL FOR POWER.

A COMMITTEE APPOINTED BY THE GOVERNMENT.

Mr. Walter Long, who is the chief of H.M. Petroleum Executive, has appointed a committee to investigate the available sources of supply of alcohol, with particular reference to its manufacture from materials other than those which can be used for food purposes, the method and cost of such manufacture, and the manner in which alcohol should be used for power purposes.

The Committee is composed as follows:—

Sir Boverton Redwood, chairman (director of Technical Investigations in H.M. Petroleum Executive); Major Aston Cooper-Key (Home Office); Mr. Philip (Admiralty chemist); Mr. H. F. Carlill (Industrial Power and Transport Department, Board of Trade); Professor C. Crowther (Board of Agriculture and Fisheries); Dr. J. H. Hinchcliff (Irish Department of Agriculture); Colonel Sir F. Nathan (Ministry of Munitions); Mr. H. W. Garrod (Ministry of Reconstruction); Sir H. F. Heath (Scientific and Industrial Research Department); Sir F. W. Black; Professor H. B. Dixon; Brig.-General Sir C. Holden; Dr. W. R. Ormandy; Mr. E. S. Shrapnell-Smith (Deputy Director of Technical Investigations in H.M. Petroleum Executive); and Mr. Horace Wyatt (Imperial Motor Transport Council).

Mr. Shrapnell-Smith will act as secretary, and communications should be addressed to the office of H.M. Petroleum Executive, 12, Berkeley Street, W.1.

Digitized by Google

MOTOR TRAFFIC

WALSALL OMNIBUS LICENCES.

IMPORTANT DECISION IN THE DIVISIONAL COURT.

The Divisional Court (consisting of Justices Darling, Avory, and Atkin) in April last heard an appeal of the Birmingham and Midland Motor Omnibus Company against convictions by the Walsall magistrates in respect of running omnibuses without a licence. The company contended that, running from a private garage yard, without picking up passengers between the yard and the borough boundary, the vehicles did not require to be licensed. This raised a point of law which had not previously been decided, and after hearing the arguments the Divisional Court, by a majority (Mr. Justice Darling dissenting), decided against the contention, and affirmed the convictions.

Thereupon the Company applied to the Watch Committee for licences, which were refused. They then applied to the High Court for a mandamus calling upon the Corporation to hear and determine the application for licences according to law, alleging that the Corporation in refusing to grant them had been biassed by consideration of the effect of the omnibus traffic on the tramway service, and also that the Watch Committee were not entitled to have regard to such matters as the waste of petrol, labour, etc., involved in the running of the omnibuses side by side with the cars.

When the matter was argued on October 18 and 21, the Divisional Court consisted of Justices Darling, Avory, and Salter. The company was represented by Mr. Tomlin, K.C., and Mr. Bruce Thomas (instructed by Mr. Sidney Morse, of London); and the Corporation by Mr. Barrington Ward (instructed by Mr. H. Lee, town clerk).

The court unanimously dismissed the company's application, with costs.

Mr. Justice Darling, in giving judgment, said:—I think this rule should be discharged. It is not necessary to add anything as to the considerations which actuate this court in coming to a conclusion upon such a matter as this, to what I said in the Blackpool case. We have to see whether upon the evidence we are satisfied that the licensing authority acted for some other reason than that which ought to influence giving a judicial decision; but we must remember that this authority is not in the position of complete independence which Judges of the High Court of Justice occupy. The Legislature has confided to the licensing authority the power of granting or withholding these licences. It has also confided to the Corporation, of which they are a part, the liberty to be the owners of a tramway, and to run cars along it. As the Legislature has done that we cannot suppose that they ever expected that the licensing authority would be as detached as a judicial body entirely unconnected with the Corporation. That does not mean to say that they are entitled to act with bias, but it does mean, I think, that they are entitled to have regard to the whole affairs of the borough, and to see whether it is convenient or proper, or whether it is extravagant and injurious, that there should be not only cars running along the streets, but a number of omnibuses as well. My difficulty is to see in this case what considerations they might act upon if they are not to act upon such a consideration as this—that there is already a tramway along the streets. I should like to treat it as though it were a tramway belonging to some person unconnected with the borough. I think they ought to do that. I do not think they ought to grant or withhold licences upon the consideration whether they would or would not make the tramway a more paying undertaking, but they are entitled to say, "Now we look at this street along which the omnibuses desire to go, and, there being already a tramway there, we must consider whether there is any necessity for this omnibus service, whether, having regard to the traffic of the streets, having regard to the people who wish to pass along there, it is necessary to have omnibuses as well as tramway lines. If they are entitled to do that with regard to a tramway belonging to a third person, I think they are entitled to do it with regard to a tramway belonging to the Corporation so long as they apply their minds fairly to the question whether the omnibuses are needed in addition to the tramway. At the time when the Corporation received from the omnibus company £300 a year for permission to run through the borough, I think they were in a very dangerous position. If the licensing authority had said, "We shall not allow you to run your omnibuses through the borough unless you pay £300 a year upon the terms mentioned in the agreement which was come to on December 23, 1913"—namely, that the company would not oppose the Corporation Bill in any event, that the minimum fare should be 4d., and an hourly service should be provided—and if the state of things had been such as they were in April, 1914, the state of things detailed in paragraph 6 of Mr. Kingsford's affidavit, which really comes to what I have just mentioned, if that had been the state of things to-day, I should have had great difficulty in coming to the conclusion that the licensing authority had really exercised their power judicially. I should rather have come to the conclusion that they would grant the licence if the company paid £300 and entered into an agreement which would not make them competitors of the Corporation's tramway, but that they would not grant the licence unless the company did that. But now I think the whole thing is altered. The letter of April 18, 1917, which the Town Clerk writes, is this:—"The desirability, in view of the imperative necessity at the present time of saving labour, petrol, and other material, of making some arrangement whereby the present duplication of public vehicular traffic on the Birmingham Road, Walsall, may be avoided, has been under the consideration of my Council, and I am desired to approach you with a view to an arrangement between the Corporation and your company whereby your omnibuses will stop at the Bell Inn and run in connection with the Corporation cars. I suggest a conference at an early date." That appears to me to be a reasonable proposal. The people who wanted to come from Birmingham would be brought by the omnibus as far as the confines of the borough, and they would then change into the cars. It is put upon the ground that it would be a good thing to have an arrangement to end the duplication of vehicular traffic. The only thing to be said against it is that people might have to get out at the Bell Inn and wait a little bit, perhaps, to change from the omnibus into the car, but so would anybody have to run that risk who wanted to go to a house a little off the omnibus route In these circumstances, applying the principle which I applied in the Blackpool case, I am not satisfied that this authority did not exercise their discretion fairly and judicially, although I recognise that they are put in a much more difficult position in exercising their judicial faculties than the judges of this court are ever placed in. If a judge owns a share in a railway company, it is the invariable rule that he does not try a case if it involves liability of the company or any dispute in which the company is involved. He does not try the case unless he mentions to the parties that he holds the share, and they agree that it makes no difference. The Legislature has not put these licensing authorities into the same detached position and they cannot, from the nature of their establishment by Act of Parliament, be expected to be so indifferent to all considerations which may be put forward by one side or the other as a judge of the High Court.

Mr. Justice Avory.—I am of the same opinion, and as I was a member of the Court that granted the rule I should like to add that I felt at the time the application was made that there was sufficient to give rise to a suspicion that the Corporation had been influenced by considerations which ought not to have influenced them in refusing the licences, and it was desirable that the matter should be ventilated. I have come to the conclusion, after hearing the argument, that there is nothing more than suspicion, and it is a suspicion which must inevitably attach to every decision of such a body which refuses to grant a licence, seeing that the Legislature has put them in the position of being owners of tramways, and interested in the profits made. I think it most unfortunate that any person or Corporation should be placed in such a position, but being placed by the Legislature in that position, I think it is the duty of the court to see that there is something more than mere suspicion before they reverse or set aside the decision of the Corporation in refusing to grant a licence. Looking at the affidavits, and having given careful consideration to the arguments of Mr. Tomlin, I have come to the conclusion that although there may be this suspicion in this case there is nothing sufficient to justify the Court in saying that the Corporation were influenced by considerations extraneous to their judicial duty. Therefore the rule should be discharged.

Mr. Justice Salter.—I agree. I have nothing to add.

The rule was discharged, with costs.

U.S.A. PETROL SUPPLY.

CONSUMPTION IN EXCESS OF THE PRODUCTION

A report recently presented to the United States Senate by the Fuel Administration states that the daily consumption of gasoline is 160,000 bbl. and exportation 34,000 bbl., a total of 194,000 bbl., while the daily production is 191,000 bbl., making a daily deficit of 3,000 bbl. Besides the figures on the daily consumption the report shows that there is only a single month's supply of gasoline in the country according to the present rate of consumption. An announcement has been made by the Fuel Administration to the effect that gasoline will have a fixed price. This is to cover domestic consumption as well as for the Allies and the Government. It is stated that the price will be lower than the present market price.

Digitized by Google

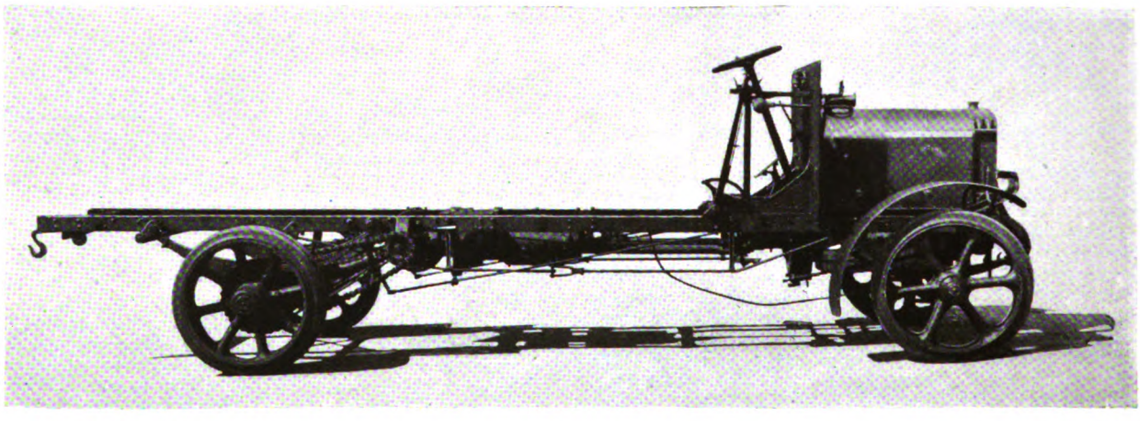
MOTOR TRAFFIC

STEAM WAGON MANUAL.*

This small volume ought to be of great service both to owners and drivers of steam wagons, though it is for the latter that it is specially designed. The great increase in the number of steam wagons, coupled with the fact that so many experienced drivers have been diverted to military work, has led to a scarcity of men skilled in working such vehicles and in carrying out adjustments and minor repairs. The bulk of the present book accordingly is devoted to such matters as how to keep the wagon in good running order with a minimum of expense and trouble, and how to carry out an overhaul. Some very practical information is given at the outset regarding points to bear in mind when choosing a steam wagon, and this is followed by the kind of descriptive matter which fits in with instructions as to attendance, adjustment, and repairs. The latter subject is dealt with at great length, and it is expounded by a large number of clear diagrams. The learners will probably be specially grateful for such chapters as the one headed "Diagnosing and remedying faults."

THE "COMMER" CAR WAR-TYPE MODEL.

"Commer" cars have proved a great success in war service, and a number of them are doing duty in France and Flanders. The authorities having decided to dispense with the chain cases that hitherto have been part of the standard specification, the chassis is now supplied in the state shown in the accompanying illustration.



A "Commer" Car War-Type Model.

MILITARY PETROL CONVICTION QUASHED.

The Surrey Quarter Sessions Court on October 18 allowed an appeal by Brigadier-General F. W. Hill against a conviction by the Farnham Justices, who imposed a fine of £5, on a charge of using a Government car to attend a private dance at Bourne, contrary to the Petrol Restriction Order. Lieut.-Col. Pickering, Assistant Adjutant General, Aldershot Command, said he authorised proceedings because he did not think that petrol should be used to enable officers to attend dances. At certain assemblies, such as Y.M.C.A. gatherings of a military character, it would be legitimate for officers to use petrol, but dances were not included. The whole question had been considered by the Commander-in-Chief of the Aldershot Command.

Evidence was given by appellant that he went to the dance as part of his duty in a car reserved for his use as general officer commanding the Canadian troops in the Witley area. It had been found advisable as a matter of policy, so that general officers commanding should better appreciate the character of junior officers just arrived from Canada, to have such meeting grounds as this dance afforded. This dance was arranged by the commanding officer for the purpose of seeing and meeting junior officers. The Bench unanimously granted the appeal on the ground that the car was in the exclusive use of a Government department to which the Order did not apply.

* A Manual of the Steam Wagon; maintenance, overhaul, garage and running repairs; how to get the best out of all types of steam road vehicles. London: Temple Press Limited, 1918. 103 pp. 2s. net.

MOTOR VEHICLES FOR MUNICIPALITIES.

Camberwell Guardians propose to purchase a Ford van.

Romford Guardians are considering the question of obtaining a motor ambulance.

Rotherham Corporation propose to obtain a new motor tower wagon for the tramways.

Sheffield Corporation are contemplating an expenditure of £2,200 on the purchase of two electric vehicles.

Southend Council propose to purchase a 2-ton Edison electric wagon for the tramways department at a cost of £1,242.

Gillingham Council are making inquiries with a view to the purchase of an electric vehicle for the collection of house refuse.

Chichester Corporation has under consideration the purchase of a motor tractor. The engineer has been instructed to inspect one recently offered for sale.

Glasgow Corporation have been recommended to purchase two 2-ton and two 3½-ton electric vehicles from Messrs. Edison Accumulators, Limited, at a total cost of £4,800.

Lambeth Council have placed an order with Straker-Squire, Limited, for the supply of one of their vacuum gulley cleaners. The machine will be similar to those supplied to Southwark Corporation.

Halifax Corporation have accepted the tender of Messrs. Dennis Brothers, Limited, Guildford, for the supply of a Dennis 60-65 B.H.P. 500-gallon turbine motor fire engine, with first-aid outfit, for the approximate sum of £1,300.

Motor Wagons for Glasgow Parks Department.—At a meeting of the Parks Committee of Glasgow Corporation the Superintendent suggested that in view of the statement issued by the Government as to the disposal of motor vehicles at the end of the war, it might be expedient to obtain one or more motor wagons. He was asked to report generally on the need of motor vehicles for the department.

Road Transport Limitations.—An order issued by the Road Transport Board, and taking effect on November 18, limits the delivery of goods by a retailer to within a distance of ten miles. The order does not apply to the Metropolitan Police District.

Control of Government Motor Cars.—In reply to a question asked in the House of Commons, the Chancellor of the Exchequer stated that definite machinery had now been devised whereby the use of motor cars by Government departments would be fully controlled with a view to restricting their use.

Motor Cars for Election Purposes.—The President of the Board of Trade announces that arrangements have been made whereby *bona-fide* candidates and their agents can obtain a limited quantity of motor spirit and the permit to use motor cars in connection with the forthcoming Parliamentary election.

Road Transport at Colchester.—Speaking in reference to the recent railway strike, Mr. Sanders, a member of the Colchester Town Council, stated that so efficient were the arrangements made by the local Road Transport Committee, that even if the strike had continued the food supply of the town would have been maintained.

Digitized by Google

MOTOR TRAFFIC

NAPIER LORRIES IN WAR SERVICE.

The Napier lorries, manufactured at their works at Acton by D. Napier and Son, Limited, of 14, New Burlington Street, London, W.1, are in the front rank of vehicles of their kind for the uses both of peace and war. One of the latter uses is depicted in the accompanying illustration, which shows a convoy of Napier lorries camouflaged in a wood. Now that the aeroplane plays such an important part in observation, it is necessary that assemblies of transport vehicles shall be carefully hidden from the enemy.

Every road near the front is at times shelled continuously, and it is only by drivers of lorries using by-ways and taking advantage of all cover that our troops are kept fully supplied with food and ammunition. Only vehicles of the utmost reliability can traverse the rough roads and surmount obstacles which are encountered on the way to their objective. That the Napier has lived up to its reputation as a vehicle of the utmost reliability, and one of the most

MOTOR EQUIPMENT OF AN ARMY OF ONE AND A HALF MILLION.

Appended is the approximate motor equipment for the United States first army of 1,500,000 men, as recently published by the motor transport headquarters at Washington :—

Army motor trucks...	40,803
Motor cycles	24,250
Passenger automobiles	7,905
Ambulances	6,598
Riders and drivers	100,000
Total personnel (men)	154,774
Officers	42,298
Non-commissioned officers	30,090
Service parks	273
Mechanicians	34,319

Napier War Service Lorries Camouflaged in a Wood.

satisfactory for the arduous work that is required of it, will, we believe, be admitted on all hands.

PNEUMATIC-TIRED TOWER WAGON.

A 2-ton Pierce Arrow truck equipped with pneumatic tires and an extension tower has been in use on the undertaking of the Springfield, Mass., Street Railway Company for two years past. Pneumatic tires were adopted instead of solid rubber tires in order to obtain the greatest possible speed, this being necessary in consequence of the large territory over which the lines operate. The truck can maintain a speed of 16 miles per hour. The tower is of the telescoping type, with a platform mounted on a turntable on the upper section, so that it may be swung around to the position most accessible for the work. The platform is sufficiently large to enable two men to work at the same time. The vehicle is much safer than a horse-drawn wagon.

The total personnel of 154,774 includes officers, non-commissioned officers, men, mechanicians, and everybody connected with the service.

Each additional American army will require a similar motor transport personnel, and it is expected that by the time the United States has 4,000,000 troops in France, 500,000 of them will be engaged in motor transport work. The Motor Transport Corps is operating 1,500 trucks in convoy trains in the United States, exclusive of the trucks used at the various army posts. These 1,500 trucks carry various kinds of merchandise and munitions for the army over an average of 100,000 miles every 24 hours. The Motor Transport Corps is desirous of securing a great number of men and officers, men especially qualified to drive motor vehicles by the thousand, and executives with business experience are wanted for officers. Men in the deferred classes of the first draft are inducted into this service.

Digitized by Google

MOTOR TRAFFIC

MOTOR TRAFFIC NOTES.

BROMSGROVE'S NEED OF A MOTOR SERVICE.—A conference of local administrative bodies at Bromsgrove has been arranged to consider the question of establishing a municipal motor omnibus service to connect various districts.

CORPORATION WAGON ON HIRE.—Hull City Engineer reports that at the instance of the Local Road Transport Board he has let out a steam wagon at 15s. a day, the hirers to find driver, fuel, and stores, and take all responsibility.

MINISTER TRAVELS BY AEROPLANE.—During October Mr. Bonar Law twice went to Versailles in an aeroplane to attend a meeting of the Allies' War Council. On the first occasion the machine made a quick passage through a storm.

QUEUES SANCTIONED FOR OMNIBUS PASSENGERS.—The new Commissioner of Police has sanctioned queues for omnibus passengers in Kensington High Street, London. The London General Omnibus Company will pay for the indication posts on the footway.

SALVAGE OF TIRES DURING THE WAR.—Under the auspices of twelve manufacturers of tire filling products, an Automobile Tire Economy Conference has been held at Chicago to form a national association of standard tire filler manufacturers, and to submit to the Government bureaux a war-time programme for salvage of tires.

WAR OFFICE ROADS COMMITTEE.—On October 14 it was announced that the Army Council had appointed a committee (to be called the Joint Roads Committee) to carry into effect the powers of control, maintenance, construction, and improvement of public roads vested in the Army Council. Brigadier-General Lord Montagu of Beaulieu has been appointed chairman.

EXCESSIVE WEIGHTS AND SPEEDS.—The Borough Engineer of Bolton has reported upon the considerable damage which is being done to the whole of the main roads in consequence of the excessive weights carried and the excessive speeds of heavy motor lorries. The Town Council have called the attention of the Watch Committee to the matter, with a view to the police taking proceedings against offenders.

ADDITIONAL CLOTHING FOR LONDON FIREMEN.—Woollen jerseys are being provided for the members of the London Fire Brigade, in order to obviate the feeling of coldness when riding to fires on motor vehicles. These articles of clothing can at present be obtained only through the Admiralty. Drivers are already provided with leather jackets. The motorisation of the brigade has now been completed.

AN UNLOADING DEVICE.—The Electricity Committee of Poplar Council have adopted a scheme, submitted by the Electrical Engineer, for providing a revolving bottom and the necessary gear for unloading, to one of the Council's motor wagons. The cost, including the necessary alterations to the body of the wagon, will be £125, and it is expected that the device will enable an additional load of clinker per day to be dealt with.

MOTOR MAINTENANCE.—An indication of the higher cost of motor maintenance is afforded by a letter which Messrs. Leyland Motors, Limited, have sent to the Westminster City Council. They contract for the maintenance of steam motor wagons at £55 per vehicle per annum, but state that when the contract expires the charge on renewal must be £100, in consequence of the increase in the price of materials and in wages.

NATAL ROADS AND MOTOR TRAFFIC.—The fact that an extensive development of the roads of Natal is to take place suggests that there will be a greatly-increased demand for motor vehicles. The decision has been arrived at in consequence of the increasing use of motors for commercial and agricultural purposes. A scheme prepared by the superintendent of roads contemplates an outlay of £1,404,000 upon a main trunk road system.

CASH DEPOSITS FOR DEMONSTRATIONS.—An effort is being made to induce the Boston Automobile Dealers' Association to abolish free demonstrations. It is proposed that the prospective purchaser of a motor truck should deposit £5 when a demonstration is requested, and for this sum the dealer would do a full day's work with a truck and provide driver, fuel, etc. If a purchase is effected the deposit would be credited on the sale. If there is no sale the dealer is to keep the money to cover the cost of the demonstration.

TRADE LORRIES AND ROAD PAYMENTS.—The Cricklade and Wootton Bassett Rural Council have complained to the Rural District Councils' Association that damage is being caused to their roads by motor lorries from a newly-established milk factory. In reply the association directed attention to an arrangement made between Bakewell Council and a condensed milk company, under which the latter have paid £50 for damage caused by their motor lorries, and have also agreed to pay a sum of 1d. per mile for each mile run during the five years from July 1 last.

WORKING COSTS OF STEAM WAGONS.—Mr. J. C. Haller (county surveyor of Notts), in his last annual report, gives the working costs for two steam wagons purchased in November, 1915, and July, 1916, for haulage of road material. It appears that the cost of hauling 15,610 tons of material transported by these vehicles was 5·09d. per ton per mile in the case of a Burrell wagon and 5·76d. with a Clayton wagon. The costs include 12½ per cent. for depreciation. Mr. Haller points out that the costs are very low, and could not be kept at this level except by very careful organisation.

THE METROPOLITAN ASYLUMS BOARD have failed to secure delivery of a steam tractor and trailer which they provisionally agreed to purchase, owing to inability, in spite of repeated applications, to obtain a satisfactory priority certificate. As a consequence the Board have purchased a 5-ton Foden steam wagon, which is between four and five years old, for £1,200. The body has been replaced by one of a more suitable type, and new wheels with rubber tires fitted at an additional cost of £300. The Board have also authorised the purchase of another similar Foden steam wagon at a cost of £1,500.

MOTOR OMNIBUS SERVICE LEVY.—In consenting to the appeal of the National Steam Car Company, Limited, for permission to extend the existing motor omnibus service from Boreham to Witham, the Essex County Council has fixed the following terms :—Payment by the company of the sum of £10 per route mile per annum, payable in advance, quarterly or otherwise, such payment to be deducted from any amount that may be due under the following mileage rate should it exceed the minimum payment—a contribution at the rate of a penny per omnibus mile. These rates are to be subject to revision after twelve months.

OMNIBUS FARES AT BRIGHTON.—Brighton Corporation have had correspondence with Messrs. Tilling on the subject of the revision of omnibus fares, from which it appears that the actual running costs of the omnibuses, owing to increased wages, price of petrol, etc., are at the rate of over £16,000 a year more than they would have been had the conditions prevailed that existed in the first six months of 1917. Acceptance of the revised charges as a "war emergency measure" is contemplated by the Council on condition that the scale of fares in force in November, 1916, shall be reverted to as soon as they are satisfied that the conditions permit.

SURPLUS WAR MOTORS.—The disposal after the war of the vast number of motor vehicles in military service is now under the consideration of one of the Reconstruction Committees, and an early decision of the problem is anticipated. A number of difficult questions have first to be settled. Machines are in all stages of repair or disrepair, and it has to be determined whether the vehicles are to be sold in their present condition or made good before sale. If the latter, it must be decided whether the original manufacturers or the State are to carry out the repairs. Another important question is whether the machines will be sold for private use or retained by the State for road transport purposes to supplement railway services.

A "DEPENDENCE" LAMP SUCCESS.—Messrs. J. & R. Oldfield, Limited, of "Dependence" lamp fame, Birmingham, send us an item of interesting news. It appears that General Headquarters of the Army applied recently to the Munitions Inventions Board for a lamp to be used for a certain purpose which necessitated that it should be hurricane proof. The Board approached Messrs. Oldfield, who succeeded in meeting the requirement. The lamp which they have made for the purpose passed through the most rigorous test to which such an article has ever been subjected, but it remained alight. The principles of ventilation adopted in this model are similar to those so successfully employed in "Dependence" lamps generally. This appears to be a great achievement, which foreshadows an even greater lamp efficiency for the car owner.

DUNLOP EXHIBITS IN A WAR PROCESSION.—In the "Win the War Day" procession through Birmingham, the Dunlop Rubber Company exhibited three 5-ton Hallford lorries—one representing Para Mills, showing pneumatic motor covers and tubes; one representing Manor Mills, showing motor cycle and cycle covers and tubes; and one representing Fort Dunlop, showing Dunlop solid rubber tires. There were also numerous rubber articles supplied to the War Office and Admiralty in connection with trench and sea warfare, including gas helmet connections. The lorries were decorated in the colours (yellow and black) which are known throughout the trade, having been standardised as the Dunlop colours in the earliest days of the company. In addition there were flags of all the Allies. Each lorry carried a representative group of women workers, and, at the request of the organising committee, six workers from the Dunlop Mills were presented to the Lord Mayor at Cannon Hill Park.

Digitized by Google

THE Tramway & Railway World
WITH MOTOR TRAFFIC SECTION

Founded 1892. LONDON, DECEMBER 19, 1918. VOL. XLIV.

STANDARDISATION OF ELECTRIC TRACK EQUIPMEMT.

Work in connection with the electrification of railways is at this moment at a standstill, both at home and abroad ; the large projects for reconstruction and extensions that were in hand had to be summarily stopped owing to the exigencies of war. There is, however, little doubt that all the undertakings proposed will rapidly develop on the conclusion of peace, and open up a large field for the electrical and railway industries. During the present state of inactivity it may be of advantage to review the present chaotic condition regarding the ways and means adopted for the electrical equipment of the track with the necessary conductor for supplying current to the trains.

It is sometimes a difficult matter to explain conscientiously the why and wherefore connected with the adoption of third rail as against the apparent advantage of overhead construction, and *vice-versa*. This peculiarity often strikes the lay mind, and presents itself in the form of a question, " Why is third rail adopted in the North of England, where the climate is the reverse of warm or clear, and the track is heavily congested with traffic, and where embankments, bridges, and generally complicated conditions of track abound, whilst it is still adhered to in a semi-tropical part where the track is practically one level run over flat, open country, with but few bridges and tunnels ? " The use of the third rail under conditions so different would appear to be the outcome of necessity for some sound definite reason. But this is not so, and its justification hardly commends itself to all and every condition of permanent way when overhead construction has so successfully been used. To the practical man familiar with the prevailing conditions of permanent way work at home and abroad an answer as to which system presents the greatest advantage can generally be readily given. There are a few leading points which must naturally be known ; these can best be obtained by a survey of the ground. The electrical equipment of the permanent way has to be dealt with on its own merits, and the question of generation and distribution of power can in this connection be ignored, since the method of obtaining current for third rail or overhead line can make no material difference, whichever system of conductor is used on the permanent way. There are conditions where third rail can be used with advantage, and, on the other hand, there are lines where the conditions are ideal for overhead construction ; hence the strict adherence to either system cannot be advanced as reasonable either on financial or practical grounds.

It will remain a somewhat elusive matter for explanation when plunging from the London, Brighton and South Coast electrification, with its overhead construction, where all obstacles have been overcome on a difficult and complicated track, and then jumping to lines abroad recently electrified under English engineers, where a clear-way for overhead construction presents itself, but where we find the third rail installed. Our system of underground railways is equipped with various types of third rail under climatic conditions not compatible with good insulation, yet on the other side of the equator the most recent electrified underground system is equipped with an overhead conductor of excellent design and simplicity.

The power-house, plant, switchboard, sub-station. equipment, cables, and rolling stock are practically standardised, and can be ordered to suit requirements from a number of reliable leading manufacturers, but no sooner is an attempt made to equip the permanent way with an electrical conductor than a diversion is found with no attempt at standardisation, neither any attempt to improve on the equipment of existing conductors towards that end, and so gain in simplicity with its attendant advantages of manufacture, supply, and erection.

The question of cost is often very misleading. The installation of so many miles of overhead construction or third rail will cost so much per mile of single or double track, but if such a figure is put forward it is as well to know what amount will be involved for modifications, renewals, and disturbances necessary to the existing permanent way, and should this be known, the further and more important item for the maintenance of the respective systems must be ascertained if a true estimate for comparison is to be made.

All this is essential in order to balance the cost fairly for this section of work, and since railways, although run for the public convenience, have yet to consider both investors' and patronisers' interests, and obtain the best return for their respective outlays, the actual merits of the cost, efficiency, and operating ought to bear their full percentage of value.

The track gauges in various parts of the world have been standardised to allow for intercommunication of traffic, and if this were not so, our railway system would lose half its use. The flexibility and advantages derived from interconnection and running of rolling stock from one point to another over different systems was realised in the early stages of railway work, and this facility ought to be extended to the electrified rolling stock. At present the electrified suburban lines are a comparatively small proportion, and it is only the local sections which affect part of the respective railways to which they belong. With the advancement of traffic conditions new extensions will be added, the multiplication of which will rapidly extend, and the demand ultimately arise for interconnection of the electrified systems.

In the light of our practical experience there ought to be no difficulty in arriving at a solution regarding the best standard system for given conditions in this country. The hauling of goods by electric locomotives

Digitized by Google

has been in vogue for some time, and a move towards standardising would be in the right direction. The weight, section, location of the conductors, and method of contact should be the first consideration; the insulation, supports, sectionalising, and bonding would follow. The many points such as anchoring, expansion joints, clearances, protection, etc., could be taken up, but would of necessity have to be adapted to the various locations and conditions to be contended with. The location and clearances of the conductor, whether overhead or third rail, will have to be treated the same way as the track, and that is to be set to a standard gauge for the conductor position relative to the gauge line of track, so that oncoming rolling stock will obtain and work under the identical conditions and range for their contactors.

The leading features to be considered for third rail construction are:—

Dangers to workers on the line and derailments.
Space occupied on track at special work.
Obstruction to re-ballasting and packing sleepers.
Expensive cable work at junctions and crossings.
Complication of continuity bonding, where electric signalling is in operation.
Gaps in conductor rail not spanned by motor coach shoes.
Alterations to station platforms, level crossings.
Installing special sleepers for insulators.

For overhead construction:—

Obstruction to clear view of signals.
Space necessary for erection of columns and bridge hangers.
Head room and insulation in tunnels.
Removal of overhanging telephone wires.
Special supports at bridges and stations.

It can be taken that the cost of third rail work is considerably below that of overhead construction, yet conditions may be such that the advantages of overhead construction are of sufficient importance to more than justify the additional expenditure.

The conditions and permanent way may present ideal conditions for overhead work, and considerably reduce the cost of erection, but at the same time involve expensive alterations for the safe installation of third rail, and so materially minimise the difference in cost and give the advantage in favour of overhead work. Of course the fact of having the track free from a live rail, and the line accessible at all times, is always a great point in favour of overhead work, and one so much appreciated by those whose business it is to maintain the permanent way.

It is readily understood that the actual capital expenditure for overhead work may be considerably in excess of third rail, but the all-important item of maintenance for track will be increased owing to the presence of the third rail. This is obvious, since repairs cannot be carried out with the same facility, therefore the additional cost of upkeep might justly counterbalance the interest on the extra capital expenditure on overhead construction.

Although the cost, maintenance, operation, and efficiency would all bear a part when standardisation was under consideration, these points should present no insurmountable difficulty when endeavouring to arrive at some decision towards conformity, and so get into line with advancements already made in other directions of railway electrification. It is not possible to be emphatic on such a technical subject, but with the aid of men who have actually designed and been through construction and running of electrified lines, a speedy summarisation of facts could be assembled. It is necessary to eliminate personal interests if any value is to be attached to the conclusions arrived at.

There is no doubt of the success derived from the electrification of suburban lines either at home or abroad. We therefore have the gratification of knowing that we are dealing with a subject of the first importance. Its successful working consequently merits every consideration. The traveller or capitalist is perhaps not so inclined to investigate the pros and cons of the various systems employed, since as far as he is concerned the results are good.

In view of the big openings for this work, which there is every reason to believe will form a large branch of engineering in the near future, some review of the many and varied systems in use is essential if any advance is to be made towards standardisation of track equipment. As a step in this direction a comparative study of third rail design and arrangement is presented in the following article.

THIRD RAIL DESIGN FOR RAILWAY ELECTRIFICATION.

By E. Capone.

In selecting the design of a protected steel rail to act as a conductor and at the same time give a good contact surface for the collection of current by a moving train, several important features have to be considered, and it may be of interest to review some of the designs in use and to compare the advantages of the respective types. A selection of the many sections in use has been made for illustration, and those presenting a large variety in design are shown, so that the contrast may give additional opportunity for comparison. In reviewing the nine designs given in the illustrations, it will be seen that some are for top, some for under, and some for side running contact. The top running system is the one with which we are most familiar, but in the light of recent successful experiences of other types, all are given for analysis.

In dealing with their selection on points of merit, it is advisable to classify the leading features which make for the development of a sound practical design of conductor rail. The points to be chiefly considered are:—

1. Space occupied on permanent way to be as small as possible.
2. Distance from rail to earth to be at least 5 in. for insulation purposes.
3. Protection to be efficient and to prevent possible contact.
4. Section to allow good mechanical attachment for protection, bonds, and anchoring.
5. To present a good wearing and contact surface.

Before subjecting the various designs to an analytical treatment, it might be as well to review the considerations bearing on the practical side, which, all said and done, is the main thing desired.

The maintenance of insulation to earth has in working been found to present no formidable obstacle, provided that the insulators are of porcelain and of solid type, provided with one lip or petticoat so as to permit the insulators being washed with the rain, and that all metal parts are reduced to a minimum in order to obtain the maximum creepage surface possible. For instance, it has been found in practice quite unnecessary to have heavy caps and bases cemented on to the insulators; these are so much waste metal, and act as an additional element of danger. Again, the old idea, as shown on Design A, of forming the lugs on the insulator as a means to prevent the conductor rail moving up and down is needless; in fact, it adds to the difficulty of assembly and increases the breakage of insulators. The ears should be vertical with rounded edges, and of such a height that on the depression of

Digitized by Google

the sleeper with passing traffic, they still leave the lugs high enough to prevent the conductor rail riding on to the top of them.

The effective design of wood protection for affording safety against inadvertent contact and at the same time allowing a liberal clearance for the collector shoe and load gauges involves considerable forethought. The design adopted should be so arranged that the lengths and fittings are interchangeable, to enable repairs and renewals to be rapidly carried out. This point is of importance when considering the rapidity with which such work has usually to be done.

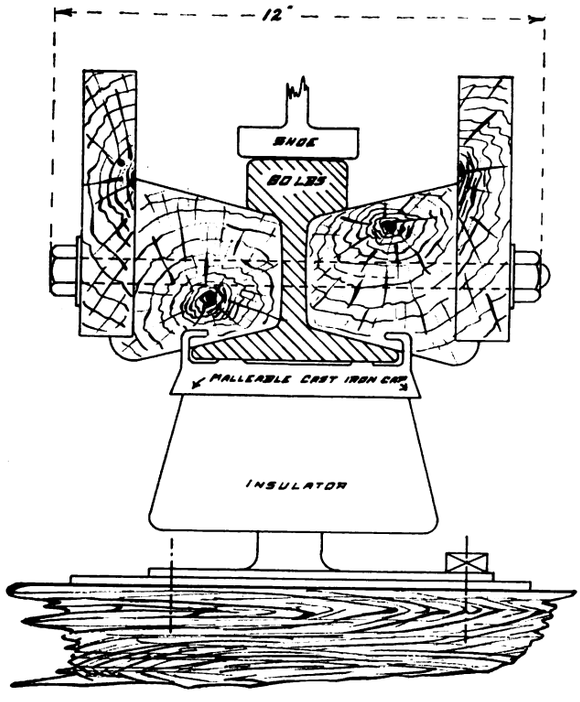
To standardise lengths and make fixed spacing between clamps and brackets is the first point to be aimed at; and whatever work is involved in the preparation of a practical system for interchangeability is amply repaid by the expeditious way in which repairs and renewals can be carried out. Clamping bolts, brackets, and nuts should have no direct contact with the rail and should not protrude. Recesses in which dust or rain can accumulate should be avoided. These many points are of importance if the maintenance work is to be kept down. These remarks apply to the special protection for ramps, expansion joints, and terminal covers. On several installations considerable pains were taken in testing and trying various forms of protection, and the work so expended enabled a compact design to be developed with good insulation and standardisation of parts. Various classes of material have been tried for use as a protection, but they either cost too much or the manufacturing difficulties were such as to prohibit their use. To preserve the life of the timber and fittings, they should be thoroughly creosoted before and after assembly in the shops, and each length should be tested to standard templates previous to being sent out.

The question of conductivity depends on the hardness of the rail, and the importance of conductivity varies with individual ideas. Generally speaking, the resistance of conductor rails is 6·5 to 8 times that of copper. This is considerably softer than the track rails, which have a resistance of 11 to 12 times that of copper. The analysis of conductor rails varies almost directly with the number of lines electrified; but it is as well to remember that it is not economy to sacrifice wearing qualities for the sake of a small percentage of gain in conductivity.

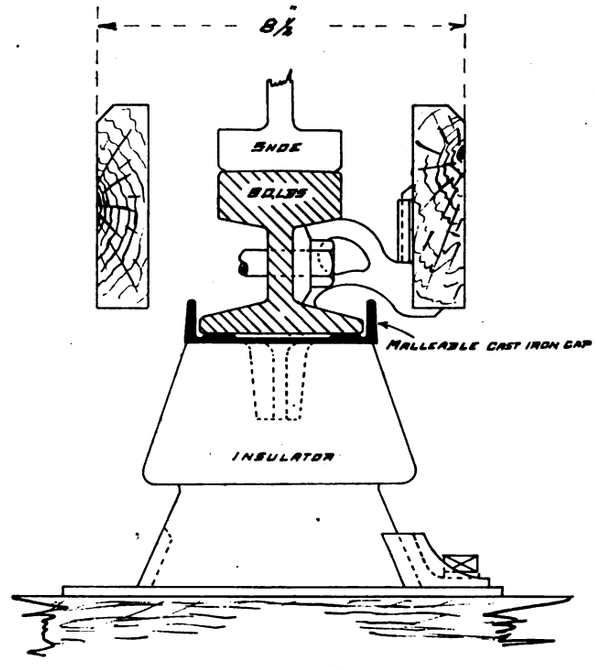
From observations of the life and conductivity of existing rails, valuable assistance might be obtained in arriving at a decision as to which gives the best results. Some rails can be observed to flake away in large pieces and bestrew the track with sheets of rust; this is an item that tends to reduce the conductivity and causes shorts on the line. The painting of rails with a preservative compound is not very nice for those who handle them, but it effectively deters corrosion for years.

The punching of holes for bonds and fish-plate bolts is usually done at the works, the bond holes being $\frac{1}{16}$ in. smaller than required, leaving sufficient metal for reamering out on site.

From the illustrations it will be seen that there is a considerable variety in use, but as yet no particular design can be looked upon as a standard. Not until the needs involved in conductor rail construction are taken up as an engineering problem will any advancement be made towards standardisation; the number and importance of the considerations bearing on this matter will vary more or less in accordance with individual ideas. The several designs illustrated enable an interesting comparison to be made. Leaving out the question of cost and maintenance, and confining our attention to the practical advantages which the various designs present, we can formulate some idea of the improvements made and their value in practice.



Design A.



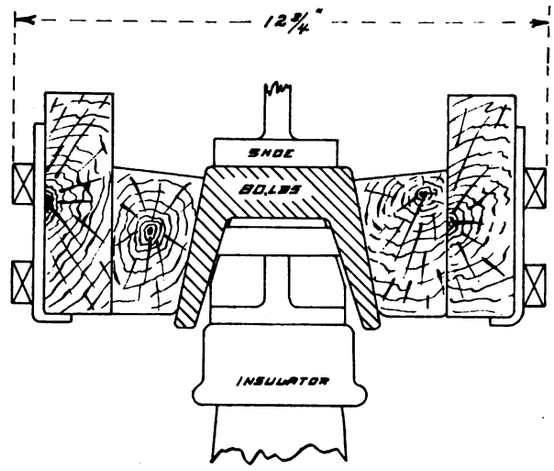
Design B.

Design A is the usual Vignole type of rail generally adopted. It has the advantage of being a standard section, admits of easy bonding, fishing up, and gives a good clearance for the insulator. It is also well balanced on insulators and allows for mechanical attachment for anchorage. The drawbacks of this design are obviously the large overall dimensions encumbering the permanent way, and the wide opening exposing the conductor rail. This design can be considered to fail on conditions Nos. 1 and 3.

Design B is a considerable improvement on "A." This design complies in all respects with the conditions

Digitized by Google

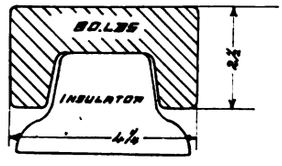
and would appear to be the best for the top-running system; it remains to be seen whether any of the under-running systems are to be preferred. The Design B economises space by 4 in. and at the same time gives a good contact area. It has a greater clearance to earth, and excellent advantages for mechanical attachment, the cap is of light dimensions, and the lugs are of the latest design; the protection is standard and detachable.



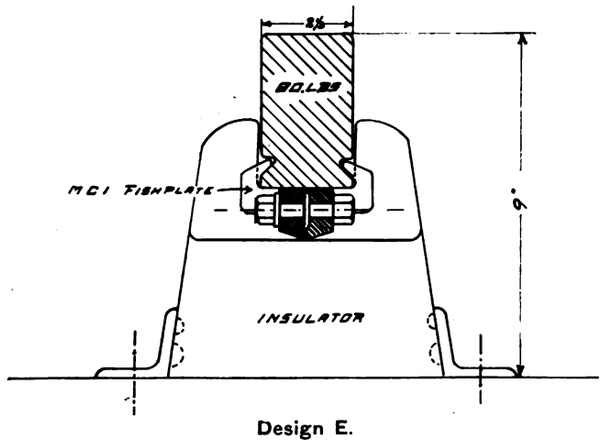
Design C.

Design C is again of large dimensions, and like "A" takes up far too much space. The conductor rail is exposed, and it covers up the insulator, which is most undesirable, as it allows the caking and accumulation of dirt. This design does not comply with conditions Nos. 1, 2, and 3.

Design D is similar to "C," only presenting a wide contact surface, and at the same time exposes a large unprotected surface; it has been used unprotected



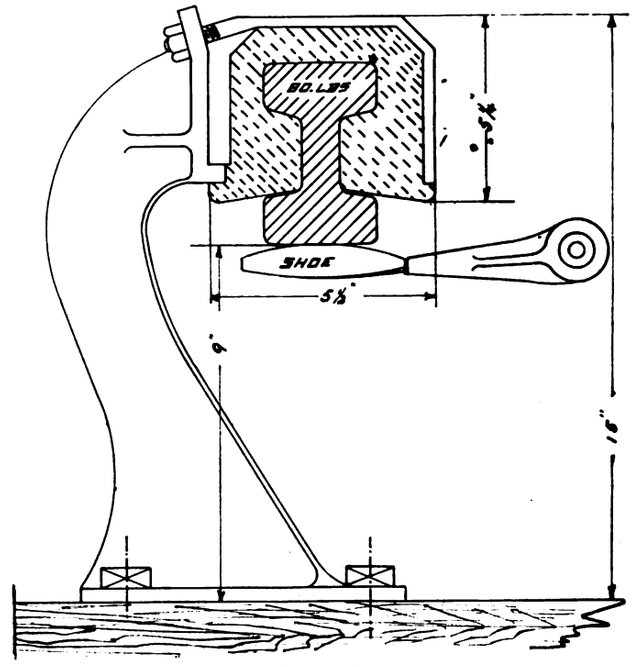
Design D.



Design E.

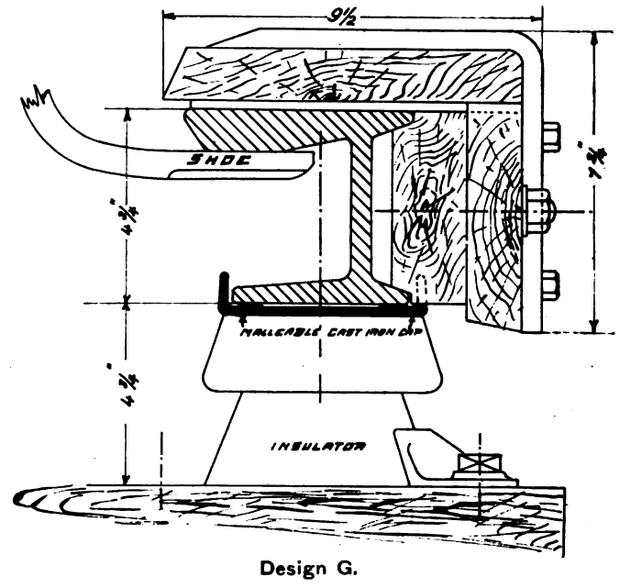
where, owing to special construction of bridges and track, a shallow rail is necessary, in order to obtain sufficient clearance to earth, or to keep within load gauge of coaches, but it cannot be seriously considered for extensive railway electrification in view of the other designs. It fails as to conditions Nos. 1, 2, 3, and 4.

Design E. This is a very compact section, and has many advantages, but the drilling of bond holes through 2½ in. of metal is a great drawback. There is also a tendency for the rail to whip and become top-heavy. The protection would be similar to type "A" or "C," hence the design can claim no special features.



Design F.

All the above designs are for top-running contact, and to obtain the necessary clearance for the shoe the width of rail and shoe combined must not be less than 6 in. This is on account of the many side movements to be allowed for, and the side play or horizontal movement should be at least 4 in., allowing 2 in. contact with rail. This imposes a corresponding distance between side protection boards.



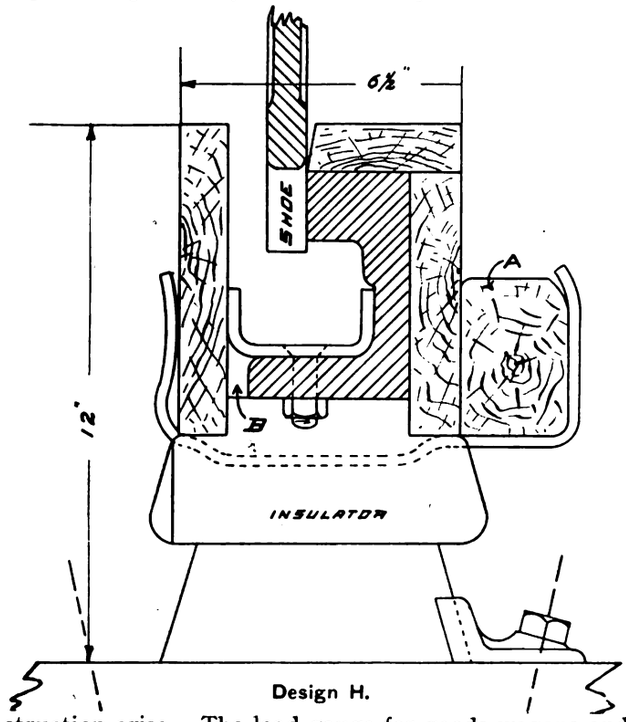
Design G.

The side boards are 1¼ in. to 1½ in. thick, which, added to the 6 in. clearance in between them, means an overall dimension of 8½ in. as in Design B, but this dimension is often exceeded as shown in Designs A and C. The exposed contact surface necessary for top-running is undesirable, as it is a constant element of danger; especially is this so when protection boards are placed so very far apart. To obviate this trouble,

Digitized by Google

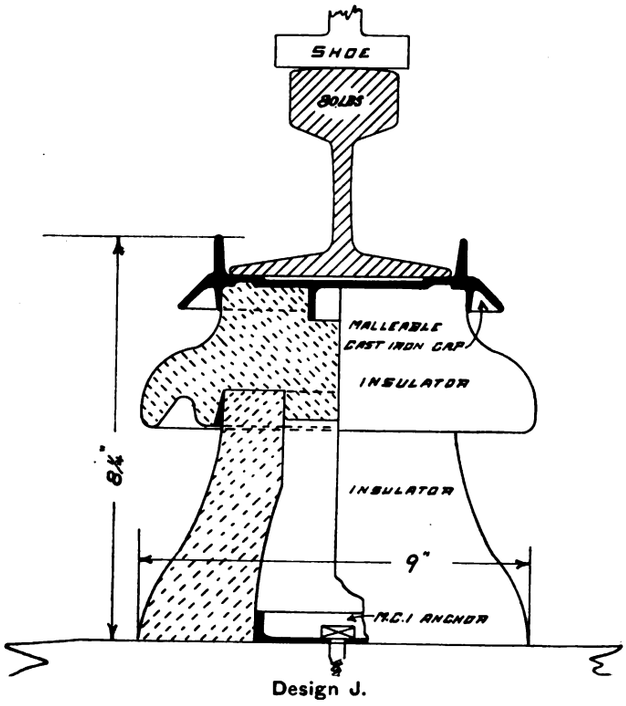
various designs of under and side running contact systems have been used, and it would appear that considerable improvements have been made.

The under-running types are not so numerous as top-running, mainly because complications of con-



Design H.

struction arise. The load gauge for goods wagons and locomotives has to be cleared, and to erect brackets to support a conductor rail is usually impossible under the average conditions prevalent on our permanent ways.



Design J.

Should there be room between tracks at some point to allow brackets to be erected on sleepers or special posts, the projecting shoe would be such as to form a big element of danger. It is obvious that cumbersome supports for a suspended conductor rail at most junctions and stations would hardly appeal to the permanent way engineers.

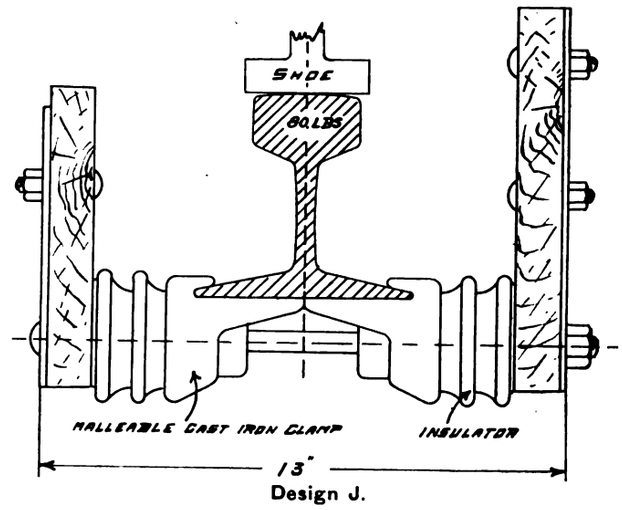
Design F is one form of under-running, and from the illustration one can see that it would be impracticable for use on our railways; it is not feasible, as it necessitates brackets.

Design G is the most recent type of under-running conductor rail and one which has been lately installed on some large suburban railway systems. The drawbacks of the top-running rail have in this design been eliminated, and the advantages which can justly be claimed for it are compactness, protected contact surface, good insulation, and safety. The practical advantages in the use of this rail have been demonstrated under trying conditions, and the fact that the insulation and smooth running have been in no way affected is a most satisfactory testimony on its behalf.

There are many points to be considered besides the actual section of a rail, such as expansion, creepage, anchoring, bonding, ramps, and sectionalising, etc., but given the advantage of experience, there are no difficulties to contend with that cannot be overcome.

Before leaving this question, it is interesting to note Design H, which illustrates a side-contact system successfully used in this country. This rail is electrified at 1,200 volts, and it will be observed that there is complete protection to conductor rail and also that there are no metal parts or attachments to the conductor rail; all supports for protection are by means of clamps. This design has a large range of adaptability and is eminently simple in construction. The wooden key A is used for clamping up the sides of the protection but leaving a space at B for drainage.

Design J may be of interest, as it is used for 2,400 volts, a somewhat different proposition to the usual voltage employed. The conductor rail is carried on



Design J.

a M.C.I. cap, mounted on a double section insulator. The lower section of the insulator drops over a M.C.I anchor bolted to the sleeper. The method of supporting the protection boards is unique and well designed, and might (in a modified form) be applied with advantage to systems employing a similar design of rail and protection. Here again we have a top-running system with a wooden trough 12 in. wide with a live rail exposed in the centre. Of course, the use of a fourth rail as return minimises the danger, but to encumber the track still further is out of the question, especially where pneumatic signalling is in use.

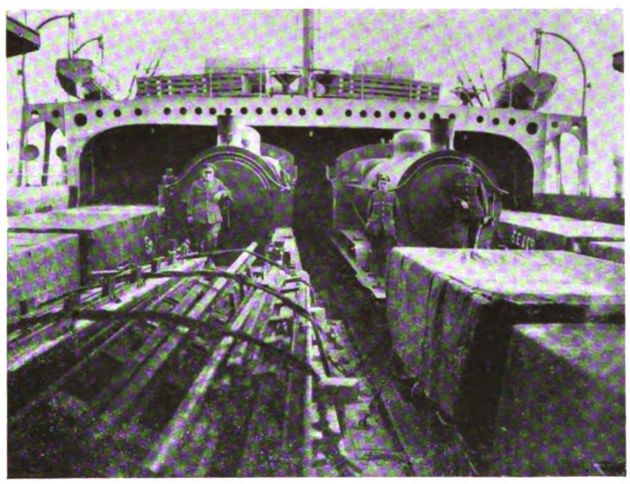
Broadly speaking, it would appear that the choice of design from these illustrations should rest with Design B for top-running and Design G for under-running. These designs best comply with the conditions most desired. Undoubtedly future work will give the opportunity of further improving them.

Digitized by Google

THE CHANNEL TRAIN FERRY.

The war has brought with it numerous innovations. With many of these the nation will gladly dispense at the earliest possible moment, but there are others which will be welcome to remain. One of these is the cross channel ferry, two of which have been established, one between Southampton and Havre, and the other, with which this notice is chiefly concerned, between Richborough in Kent and Calais and Dunkirk. The scheme for such a ferry was approved by the Government early in 1917. The construction of the necessary port occupied about a year and the ferry has been running for about ten months. It has performed a very valuable war-time service and will continue to play an important part in post-war operations. Nearly 20,000 ten-ton railway wagons or their equivalent and nearly a quarter of a million tons of transport have been carried by the ferry.

The idea of a cross channel ferry is, of course, no novelty to readers of this journal, who are acquainted with the plans that the Channel Ferry Company have for many years endeavoured to carry out. Largely owing to lack of co-operation on the part of the railway



Trains on a Channel Ferry Boat.

companies, those plans were still unrealised at the outbreak of war. Soon after, however, the project was taken up by the War Office, and on further investigation the Government, prompted by the stern necessities of the war, ordered the carrying out of the scheme. When peace is declared it is to be hoped that the Channel Ferry Company's plans will at length be realised, and that permanence will be given to the undertaking, which will add to the speed and convenience of the Continental services from London, both for passengers and goods.

The train ferry is in no sense an experiment. It has long been in use with complete success in Canada, the United States, and Scandinavia. It is also proposed to establish a train ferry across the Mediterranean from Marseilles to Algiers, a distance of about 750 miles, and one has been suggested for the sea passage from England to Ireland.

For the cross channel ferry three boats were provided. These are approximately 360 ft. long, with a breadth of 60 ft., and a draught of 10 ft. The speed is 12 knots. Each boat has four lines of track, the total length being sufficient to carry 54 ten-ton wagons or their equivalent of other rolling stock. Communication with the shore is made by means of a bridge, which can be raised or lowered to the level of the train deck, which varies of course with the state of the tides.

Trains run direct from the South Eastern and Chatham Railway system at Minster over the sidings at Richborough right on to the main decks of the ferry steamers. By a simple arrangement of chain locks, the trains are kept securely in position and on arrival at the French port proceed direct to their destination. On the first occasion when the ferry was used, the steamer carried 54 trucks, and in 20 minutes after arrival at Calais the trucks had been marshalled into trains and were *en route*.

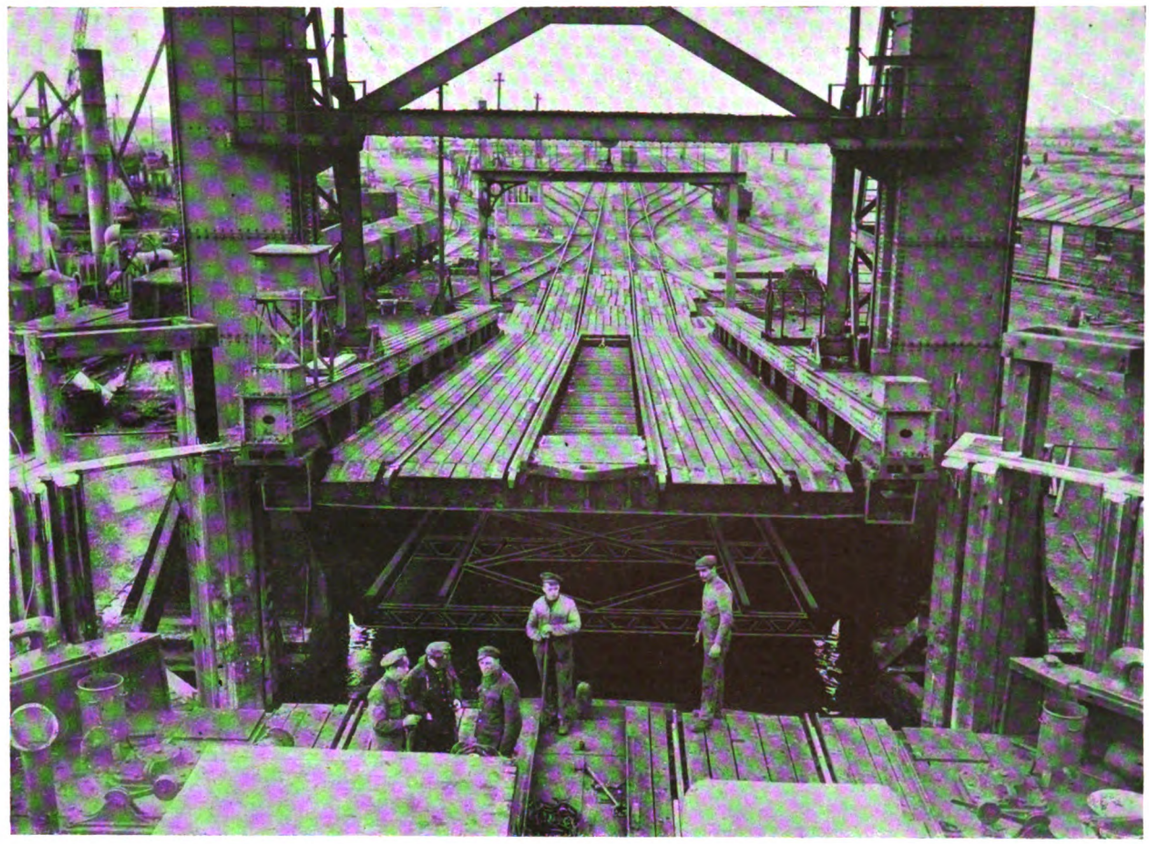
The port depot for the train ferry is entirely new, having been commenced at Richborough a little over two years ago. Prior to that, beyond a few shepherds' huts and a disused gravel pit and wharf, the site, which now occupies over 3½ square miles of the marshes between Sandwich and Pegwell Bay, was practically barren. Now it is a buzzing hive, for here the Inland Waterways and Docks Department of the War Office have built an up-to-date military port, replete with wharves and cranes, barge building yards, and a depot capable of accommodating 20,000 men, and with a terminal for the first train ferry ever run from these shores. From this port has radiated traffic to all the battle fronts of the war, and from it have also gone thousands of officers and men to undertake inland water transport in spheres as far afield as Mesopotamia and Salonika, and, most recently, to the Murman coast. From December, 1916, to the end of September of this year, by its barge service alone, it had carried to France 1,136,000 deadweight tons of war material comprising ordnance stores, guns, ammunition, army service stores, royal engineering stores, hay and straw, foodstuffs, hospital stores, aeroplanes, and even such products of modern defensive warfare as "pill boxes." To maintain this service at highest pressure, 232 specially designed barges capable of navigating on French and Belgian canals and waterways have been in commission together with a fleet of 50 tugs and five 1,000-ton steel barges. On one day in August last over 6,000 tons of war material was sent overseas by barge from this port alone, some 32 barges being engaged in the transit.

What the Train Ferry has Done.

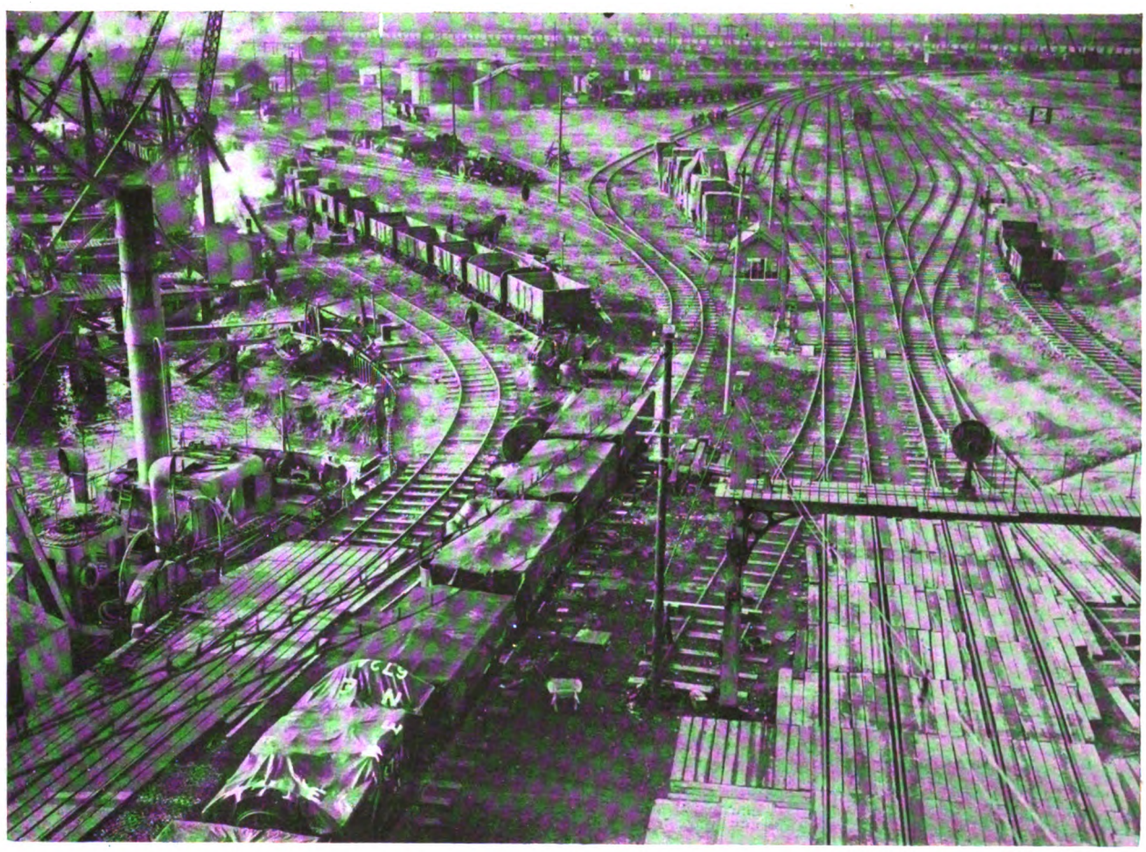
To the credit of the train ferry, which has been in operation for barely ten months, there is a deadweight tonnage of over 160,000, a very creditable performance when an analysis is made of the character of the traffic. By this ferry huge 14-in. guns on railway mountings, some weighing nearly 300 tons each, new locomotives of over 90 tons, 6,200 new war department trucks, 328 brake vans, nearly 700 tanks, 12-in. howitzers, aeroplanes, etc., besides whole train loads of stores, were run directly on to the steamers' decks from the English railway system and off on to the French railway system, thus obviating the loss of time in shunting, unloading from trucks, and reloading and unloading so far as ships are concerned. A second train ferry is run by the I.W. and D. from Southampton to Dieppe, and, although the stretch of sea between the terminals is much greater than that between Richborough and Calais, the traffic figures are very creditable. The combined exports and imports by this means of transport have justified the policy of the War Cabinet in embarking on this venture. The I.W. and D. is particularly and perhaps justifiably proud of the achievements of the system.

When the scheme for establishing a war port at Richborough was first decided upon in the late spring of 1916, there was no provision for this ferry. To transform the stretch of marshes into an up-to-date military port was by no means a small task. In 1915

Digitized by Google



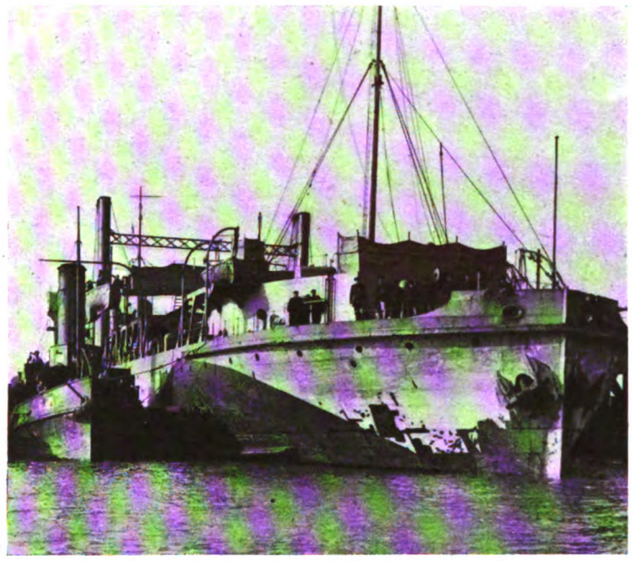
Adjustable Gangway between Boat and Shore.



Railway Sidings at Richborough—The Approach to the Ferry is Seen in the Foreground.

Digitized by Google

and the early part of the following year an inland water transport service of barges was in force from Dover to the northern French ports, but owing to restrictions imposed by the fact that it was fast becoming an important naval base, and certain difficulties as to tide and want of store accommodation, it was found imperative to obtain some suitable base upon the south-east coast within easy reach of France, capable of being quickly brought into use in connection with inland water transport operations. The choice fell upon Richborough, the sheltered position of which offered not only protection from the weather but was thought to afford comparative security from enemy attack. That this opinion was well founded is shown by the fact that never once did enemy aeroplanes damage the depot. It may also be mentioned that not one of the 10,000 barges which put out has been lost by enemy action.



The Bow of a Channel Train Ferry Boat.

June, 1916, saw a start made on the construction of the port, one of the first steps taken being to dredge the River Stour, widen it, and divert its course by a clean cut through the marshes of nearly a mile. Where it was possible at low tide for an athletic man to jump across it, the river is now 350 ft. wide, opening out to 500 ft. for the train ferry wharf for some distance from its mouth. Mud and gravel excavated from the river bed have been utilised in land reclamation, while the contour of the site has been reduced to a dead level over the whole 3½ square miles. In addition there are 80 miles of sidings, a large wharf nearly a mile in length fitted with electric overhead cranes, three camps, "Kitchener," "Cowan," and "Robertson," composed chiefly of huts built of reinforced concrete with gravel excavated from the site, an up-to-date barge-building yard, from which 132 fabricated barges of special design have been launched and five barges built, with machine shops, forges, compressor houses, etc., traffic sheds, power stations, and many other buildings which make the depot complete. All these works were carried out by I.W. and D. sappers, superintended by skilled civil and mechanical engineering officers with experience in harbour construction, assisted by a competent staff of N.C.O.'s, the whole being brought into a state of efficiency within a short space of 15 months.

For the working of railway and barge traffic, officers and men skilled in that form of transport were enlisted. On the network of railway tracks at the back of the wharf, approximately 540,000 trucks have been run, involving a mileage approaching 65,000. At the wharf tonnage has been handled with surprising celerity. In August last the tonnage handled per man per hour at Richborough averaged ·89, which is probably better than any port in the United Kingdom. Statistics show that this level was maintained, the whole personnel realising to a man the necessity for putting forth every ounce of effort to keep the armies at the front supplied.

Of the many-sided activities at this port it is impossible to deal in detail; suffice it to say that a general air of efficiency pervades the whole organisation. Working with a highly organised staff at the War Office, first controlled by Brigadier-General A. S. Collard, C.B., C.V.O. (now Major-General), and since May, 1917, by Brigadier-General A. S. Cooper, C.M.G., late general manager of the Nigeria Railways, the camp and depot at Richborough have been under the charge, since the construction was commenced, of Brigadier-General A. J. Allen-Williams, C.M.G., chief agent and engineer for the Hong Kong Harbour Works and Construction, and his staff of marine, traffic, and mechanical engineering experts. With this undertaking should also be associated the names of Sir Guy Granet and Sir Sam Fay, successively Director-General of the Movements and Railways Branch of the War Office; also Mr. J. Percy Clarke, late general manager of the Buenos Ayres Great Southern Railway, and latterly Mr. Oliver R. H. Bury, late general manager of the Great Northern Railway, the last two gentlemen having given most valuable assistance as hon. deputy directors of the Inland Waterways and Docks Directorate. To all these and the personnel working under their direction congratulations are due for the success of this remarkable and valuable enterprise.

AERIAL TRAFFIC.

Plans for Training Engineers and Mechanicians.

Under the auspices of the Government a project is being planned for the world-wide transport of passengers and mails by an air service. In conjunction with the Aeronautical Institute of Great Britain, the Ministry of Labour has inaugurated plans for preparing ex-officers and men of the service to fill posts in connection therewith.

Mr. Blin Desbleds, the secretary of the institute, has made the following statement regarding the project:—

"Apart from the Royal Air Force, there will be many openings for airmen and mechanics in the new service after the war. It is proposed to establish routes to various parts of the world—even to Australia—and there will be many stations where aeroplanes may be overhauled, refuelled, and changed for a fresh machine. At these stations will be needed men experienced in every branch of aeroplane construction and repair. Specialists, such as are many of those in the Air Force to-day, will not suffice. There will be great scope for aeronautical engineers and mechanics, but they will need to be thoroughly trained. With this object in view, the Ministry of Labour and the institute have arranged for special classes which are already open, so that the men who would adopt the new career may prepare. Aspirants would do well to prepare now, for the aerial service will soon be more than a project.

"The routes will be overland as far as possible, but in some cases this will be impracticable, as in a trans-Atlantic service. Unless aerial science reaches a stage of efficiency such as will obviate the difficulties of long over-seas flights, floating stations may be necessary. They are certainly possible. The advantages of an aerial passenger and mail service may easily be imagined. Consider, for instance, the present postal service to South America, a country that will be still more important in international trade after the peace. At present only about seven exchanges of letters may be made in a year between business men; the aerial post will enable them to make something like twenty-five."

It is reported from Germany that regular air traffic was commenced there on December 7. The machines used have an average speed of 80 miles per hour, and the journey from Berlin to Cologne will take about 4½ hours. The aeroplanes will carry mails and passengers, the rate for the latter being about 4s. per mile. A new large aeroplane is being constructed by the Schutte-Lenz Company which will carry about 40 passengers—more than a top-deck motor omnibus.

Digitized by Google

THE DISTRICT RAILWAY JUBILEE.

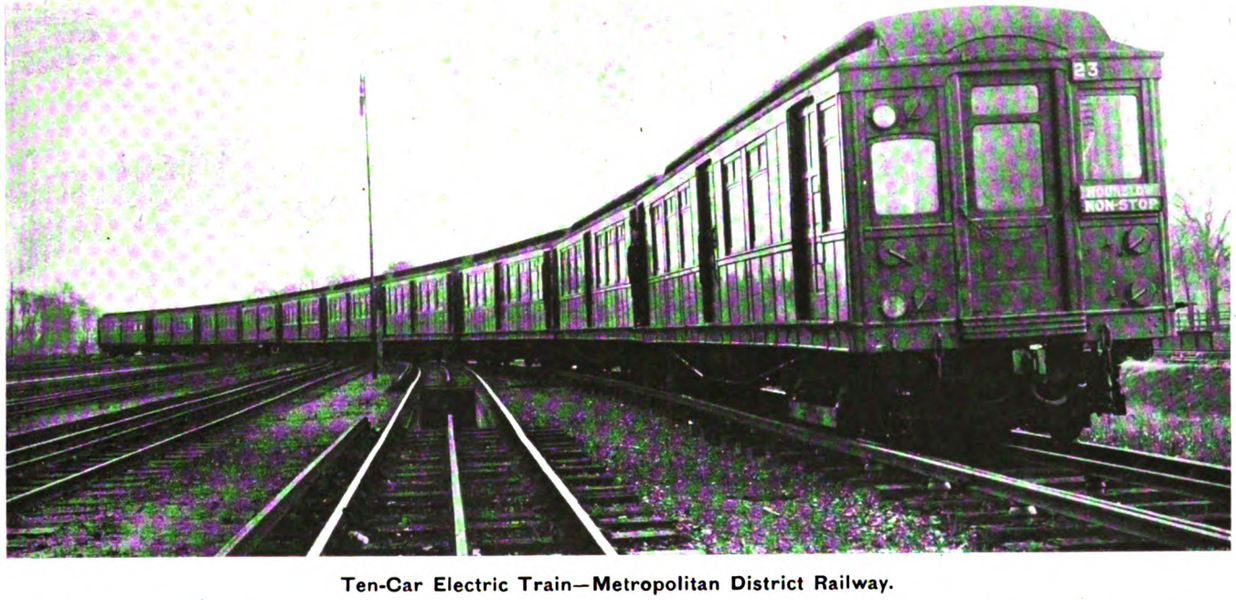
(CONTRIBUTED.)

In the stress of war's happenings a matter of railway interest that passed almost unnoticed is the fact that the year 1918 marks the jubilee of the Metropolitan District Railway. Few indeed would recognise in the electrified line of to-day, with its capacious and well-lit stations, the old "steam" District of the past with its smoky tunnels and subterranean vaults. If

A District Railway Steam Train—The Old Order which was Changed in 1905.

testimony is needed to the popularity and appreciation of the present services it is readily obtainable from a study of the daily traffic on the line. Opened on October 1st, 1868, the promoters littled dreamed of the ramifications which would become part of the system. From a small section of track between High Street, Kensington, and Gloucester Road, the District has now extended into a vast network of lines serving the outlying suburbs of the east and west of London, as well as providing interchange facilities for reaching every part of the metropolis. In the maximum train service, too, there has been an increase of from 18 trains an hour in steam days to 43 at the present time, and a corresponding reduction in running time on a typical journey—Ealing to Mansion House—from 50 to 27 minutes.

Although the line was opened in 1868, it was worked by the Metropolitan Railway until 1871, when the District took over the line and acquired their own staff. From inspection of the first working time table it would appear that eight locomotives were employed. At the conclusion of steam running there were 54. The service in 1871 was five minutes in each direction, 12 trains per hour, half working between Moorgate and Mansion House, and half between West Brompton and Mansion House. When the London and North Western Railway and Great Western Railway in 1872 began working over the District system, a half-hourly service to and from each system was arranged, but from the time table it would appear that both companies' trains were booked to run at the same minutes after the hour. Although the times were amended at a later date, history does not say how the initial difficulty was overcome.

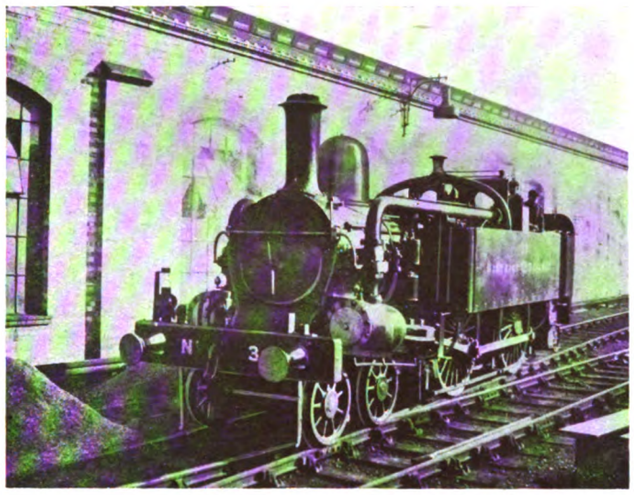


Ten-Car Electric Train—Metropolitan District Railway.

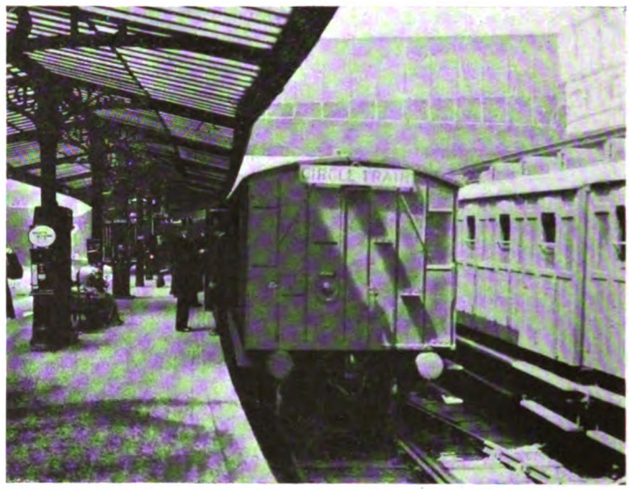
In 1883, there was a service of express trains on the District to Windsor from the Mansion House, the

Digitized by Google

trains running fast between Ealing and Slough, and many incidents are recorded of the District train drivers endeavouring to keep pace—with resultant oscillation of the passengers—with the G.W.R. broad gauge trains on the main line. The Windsor service was discontinued in 1885. If this rather unwise withdrawal had not taken place, there might have been



A District Railway Engine.



Steam Trains in the Old Mansion House Station.

possibilities of great development. In 1902 District engines and trains were also run as far as Upminster on the London, Tilbury, and Southend Railway. Now through corridor trains run direct from Ealing to Southend-on-Sea.

For the District Railway, the traffic-carrying problem is not an altogether new one, as various notable events, such as Queen Victoria's Jubilee in 1887, the omnibus strike in 1891, the wedding of the present King in 1893, the Diamond Jubilee in 1897, and the Coronation celebrations of 1902 and 1911 taxed their resources to the uttermost. The company were even sued at the time of the last Coronation by an ex-police constable who had his watch stolen at Victoria. He claimed for the cost of the watch and made the plea that "insufficient arrangements" were made by the railway company to cope with the traffic. Mr. W. E. Blake, the present superintendent of the line, gave evidence on behalf of the company, with the result that the plaintiff lost his case. The crowds using the line in connection with the Oxford and Cambridge Boat Race and the Wimbledon Camp will also be in the memory of a good many people.

Since the war, in addition to handling unprecedented traffic with a depleted staff, the District and Tube Railways have rendered a great public service in sheltering a large proportion of London's population during air raids.

Mansion House Station of the Electric Traction Era.

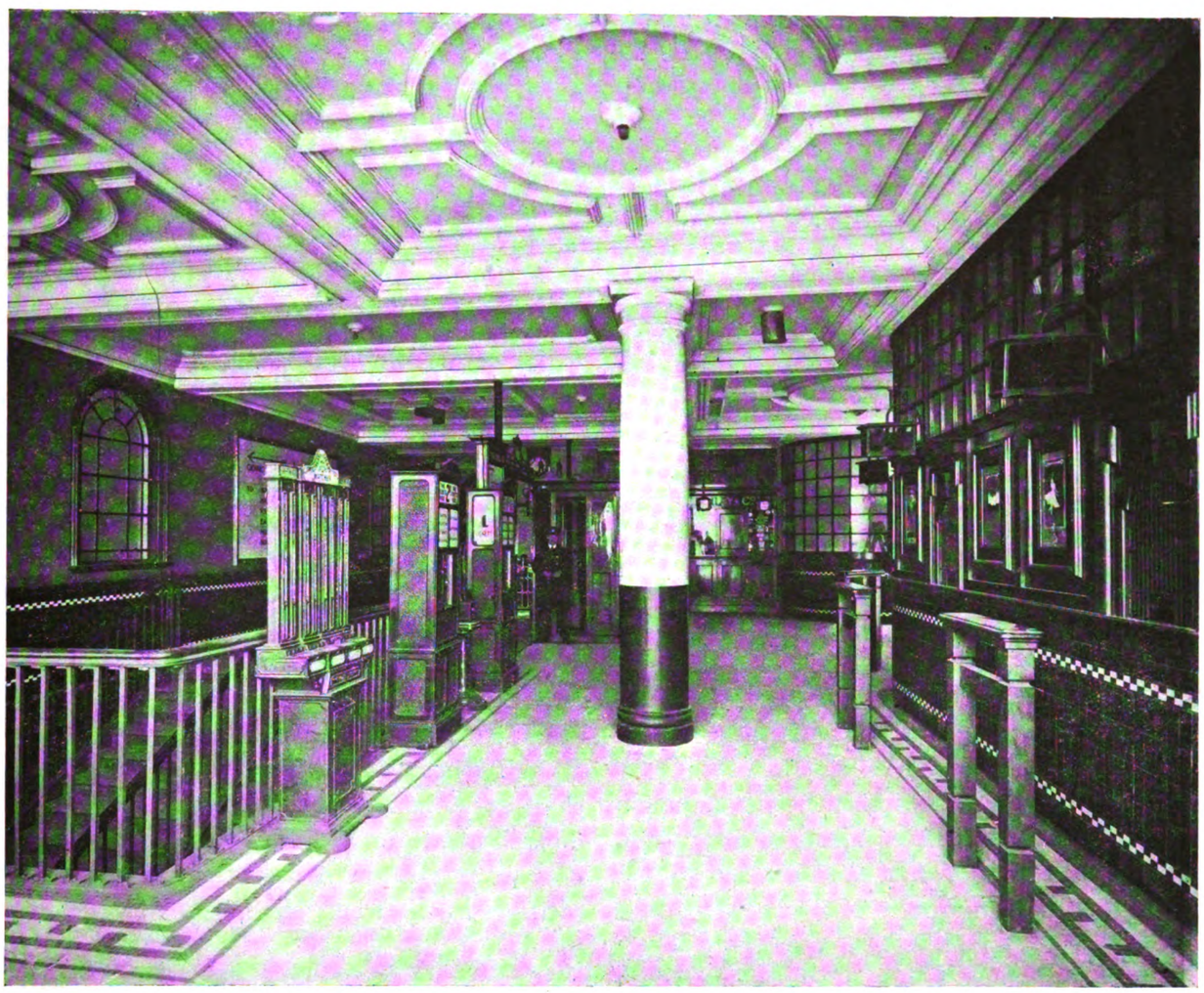
The transition stage from steam to electrical working was a time of great anxiety for the officials, as in addition to being somewhat of an experiment, a number of steam trains were interspersed with the electric, and very little time had been available for training the locomotive drivers to handle the electric trains. Neither had there been much opportunity for trial running.

Digitized by Google

The total cessation of steam working on July 1st, 1905, and the introduction of electrical working were marked by a series of mishaps. First of all, the positive rail was torn up on one portion of the line by a passing train, and a controversy arose as to whether this was caused by a Metropolitan or a District train. This accident brought the service to a standstill on certain sections at 8 o'clock in the morning. Later, there was a severe rainstorm which succeeded in totally disabling the whole electric service owing to the floods which arose. Motormen had to be sent back to Lillie Bridge yard to bring out the steam locomotives, and by midday a normal steam service—including some special trains for Lady Jersey's garden party at Osterley—was in full swing. On July 2nd, the electrical service was restarted and, from that day onwards, with the exception of minor mishaps and one rather serious failure of current at Chelsea, there has been no complete cessation of the service.

That it was not altogether easy running for the mechanical staff is evident from many of the peculiarities which had to be dealt with in the early rolling stock. Before electrical running was universal, and while a number of steam trains were still in operation, a great deal of trouble was experienced with the wheels of the steam trains, caused by the rails being cut in an unusual manner by the electric trains. The old steam road was not strong enough for the new stock, and the wear on the track made it an exceedingly difficult task to prevent derailment of the District engines.

Of the original 1871 staff the number still remaining can be counted on one hand. They include three station-masters—at Acton Town, South Harrow, and High Street, Kensington—and two drivers. Of the officers of the steam road the only one remaining in harness is Mr. W. E. Blake, the superintendent, who joined the District Railway staff as a boy in the chief inspector's office in 1887. He subsequently rose to be chief staff and then chief time table clerk. When Mr. John Young was appointed general manager prior to the electrification, Mr. Blake was chosen for special duties in connection with the conclusion of steam working. After the installation of electrical working in 1905, he was appointed operating superintendent; two years later—when Sir Albert Stanley was appointed managing director of the companies—he became superintendent of the line. On the reorganisation of the managerial administration of the London Underground Railways and the London General Omnibus Company in 1915, Mr. Blake's duties were again enlarged and he became superintendent of the Tubes in addition to the District Railway, under the operating managership of Mr. H. E. Blain.



Booking Hall of Temple Station, Thames Embankment.
(One of the Reconstructed Stations of the District Railway.)

Railless Traction.—Reports on railless traction are to be supplied to the members of the Walthamstow Tramways Committee, who are shortly further to consider the subject.

Digitized by Google

THE
Tramway and Railway World

FOUNDED IN 1892 AND PUBLISHED BY
THE TRAMWAY AND RAILWAY WORLD PUBLISHING COMPANY; LIMITED,
AMBERLEY HOUSE, NORFOLK STREET, LONDON, W.C.2

SUBSCRIPTION RATES

THE TRAMWAY AND RAILWAY WORLD can be obtained, post free, at the following rates:

FOR THE UNITED KINGDOM—Twenty-five Shillings per annum.
FOR ALL PLACES ABROAD—Thirty Shillings per annum.
Single Copies—One Shilling (Postage, 2 pence—Abroad, 5 pence).
All back numbers—Two Shillings.

THE ANNUAL SUBSCRIPTION INCLUDES 64 ISSUES, OF WHICH 12 ARE ILLUSTRATED NUMBERS.

In consequence of the restrictions on the use of paper, readers will be unable to obtain copies of THE TRAMWAY AND RAILWAY WORLD unless a definite order be given in advance. Those who order copies in this way from newsagents and experience any difficulty in obtaining them should communicate with us.

THE EDITORIAL AND PUBLISHING OFFICES OF
THE TRAMWAY AND RAILWAY WORLD
ARE AT AMBERLEY HOUSE, NORFOLK STREET,
LONDON, W.C.2

Telephone No.: GERRARD *2948.*
Telegraphic Address: "TRAMIGRO, ESTRAND, LONDON."

LONDON, DECEMBER 19, 1918.

Development of Transport.

It is a long lane that has no turning, and at last we seem to be within sight of the end of obstruction and stagnation on the one hand and senseless competition on the other, which have for so many years obstructed transport organisation and development in this country. As regards railways and canals, and with respect also to tramways and the development of electric power supply, projects of innovation have now been set on foot that can hardly fail to result in real progress. The war—that bash on the head, to use the expressive phrase employed by Mr. Lloyd George—has been effective in arousing both the Government and the people generally to the necessity for reform and development. The terrific experience of the war has indeed awakened our statesmen to the urgent necessity of progress. The earliest symptom was the appointment of a number of experts and business men as committees to deal, among other things, with matters relating to transportation and electric power supply. The reports of these bodies issued from time to time during the past year have proposed sweeping changes on lines which have long been advocated by the manufacturing and commercial community. It is apparent from the statements of the Coalition leaders during the General Election campaign that they have given careful consideration to the reports of these committees. Chief credit for bringing to the front a vigorous constructive and development policy is due to Mr. Lloyd George. By his work at the Ministry of Munitions, and by his energy and initiative as Prime Minister, he has shown that not only can he appreciate the necessities of the situation, but that he has the driving force to get things done. Among matters which he has promised shall be taken in hand is the improvement of the whole transport organisation of the country. This is to be developed by State aid and control. The railway system is to be unified under some form of nationalisation, the details of which have probably not yet been fully determined upon. The proposals will have the sympathetic support of Sir Albert Stanley, the first traction expert and business man to preside over the Board of Trade, who thoroughly appreciates the advantages of unified management. Some indication of the advantages that should be derived from the change may be inferred from the results attained under the war emergency management of the Railway Executive Committee. Satisfactory proof of the feasibility of national ownership and operation of railways is to be obtained from a study of experience in Australia and elsewhere, and those who view the coming changes with disfavour and even alarm would do well not to take too insular views. There is no reason why methods that have been found satisfactory elsewhere should prove unsuccessful here.

Railway Unification.

There are far too many railway companies with independent control. The whole system requires unification of direction and management. This unified control should be exercised by a body of highly trained experts, whose sole business it is to provide efficient transport at the lowest practicable cost consistent with the payment of proper wages to the staff and employees, and reasonable interest on the capital involved. How this unification may best be accomplished must be left to the decision of Parliament after a thorough investigation of the whole question

Digitized by Google

in all its relations. But it is already clear that in the serious economic condition that will confront the nation after the war the wasteful management of the railway system as a whole that prevailed before the war cannot be allowed to continue. Competitive services, rival organisations for canvassing for goods traffic, and separate elaborate schemes for each company, all doing the same sort of work and often wastefully overlapping, must be superseded by one general organisation. Preferential rates on imported goods must become a thing of the past. In these and other ways enormous economies may be effected which will help the railways to maintain their financial stability. It is clear that out of existing railway revenues the companies cannot afford to pay the high wages now ruling. As soon as Government control and aid which have lasted during the war are removed the companies will find themselves in a most serious position unless something is done. Wages cannot, and, indeed, should not be brought down. The cost of materials is not likely to return to anything like the pre-war level for a long time. The immediate thing to do therefore is to reduce expenditure otherwise, and to foster and develop the railway business by a unified management which would greatly increase facilities and so develop traffic. Passenger fares may not be brought back speedily to the old peace time level, but the present scales are hardly likely to be maintained. There will be great difficulty in securing higher rates for goods and minerals. Accordingly it is to the economies which may be secured from unification that we must look for aid. It is to unification also that the public must look for greater efficiency and convenience. These considerations would apply whether the railways are nationalised or not. Sound finance and scrupulous fairness to existing interests ought to characterise any scheme which the Government may bring forward, and they may be trusted fully to investigate the whole subject before making concrete proposals.

Tramway Organisation.

Sweeping reforms, though of a different kind, are called for in connection with tramways and light railways. Mr. Lloyd George has made a strong point of the development of such undertakings for the benefit of agriculture and for housing schemes. It is many years since the development of light railways for the benefit of agriculture was attempted, but the Light Railways Act has been a failure. The causes are well known, and are remediable by an energetic Government. Parliament can remove existing restrictions, a cheaper form of construction can be allowed, objections from locally interested parties should not have undue weight, financial aid can be provided where necessary. As to the great development of housing schemes, this is only an awakening to facts long known. Some of our urban tramway systems have been extended into surrounding semi-rural districts, and workmen's dwellings have been there erected. For the proper extension of such schemes all the difficulties which beset extensions, especially by companies, should be abolished. As is now recommended by one of the Government's Committees, and as has been urged for years by those who knew best, the Tramways Act of 1870 should be repealed or radically altered. Adjacent tramway systems should be linked together and the construction of interurban lines encouraged. The latter would aid agriculture just as much probably as light railways on private land. The vista of possible development appears almost endless. There is, of course, no suggestion that in the case of tramways and light railways there should be, as in the case of the railways, unified control and management. Whatever extensions take place the tramways of the country cannot be worked as one whole. But there could be a general controlling authority which could see to co-ordination where practicable, which could devise schemes for extensions and linking up, and see that they were put into execution. It should have powers to overcome unreasonable obstruction, and in regard to both existing and new lines it should provide that connections are made with railways and with manufacturers' premises. A great deal of track reconstruction will have to be carried out within the next few years. Would it be too much to expect that the new rails should be provided with sufficiently wide grooves to admit the flanges of the wheels of railway wagons ? That has been done already in some places ; why not in all places where desirable ? The parochial idea about tramways,

Digitized by Google

just like the parochial idea about electric power supply, must be swept away. In both these fields of industry the country might well be mapped out into large areas, each under one control, and each co-ordinated where desirable under the general control already mentioned. All the politicians say that this country is to be reconstructed. No more favourable field for that reconstruction exists than the proper systematic development and co-ordination of tramways and light railways.

IMPROVEMENT OF TRANSPORTATION.

THE PRIME MINISTER'S PROGRAMME: "INSPIRATION AND CONTROL OF THE STATE."

Mr. Lloyd George is the first Prime Minister who has seen clearly the supreme importance of transport to the national life. But he has done more than this. He has had the perspicacity to recognise that improved transportation is essential to the furtherance of all projects for reconstruction and for the development of agriculture and the expansion of trade and industry. In an important speech, in which he outlined some of the reforms he regards as necessary, he said :—"*There is the problem of transportation, left very largely to chance—railways, canals, roads, tramways—all vital to the life, the industries, the amenities of the people of this country. That problem must be taken in hand under the direct inspiration and control of the State. Electric power, so necessary to industry and comfort—that must be taken in hand. All these problems require thorough, sympathetic, courageous working out. All these questions we must face like patriots and not like partisans.*" It is true that this is a very general pronouncement, and it may be said that it is impossible to carry out all the changes implied in it within any readily measurable period of time. On the other hand, the war has taught us many lessons, and one of the things which experience has impressed upon statesmen and people is that it is quite possible rapidly to bring about vast constitutional and social changes that in pre-war days would either have been impossible or could only be effected through years of political struggle. In any case it can only be to the advantage of the nation that the Prime Minister so clearly perceives the necessity for progress in the means of transportation in this country.

With a well-designed scheme of transport, in which the various services are properly co-ordinated, so that all branches of agriculture and manufacture and trade are served in the most direct and economical way, we shall be able to obtain that great development of our resources that alone can enable the community to meet its obligations and secure better conditions of life than have existed hitherto. It is all to the good that the point of view of politicians has been altered; that doctrinaire theories and party shibboleths have been largely abandoned; that practical common sense and a rapid adoption of means to ends are now more dominating features than they were before the old conditions were destroyed. Naturally the proposals foreshadowed by Mr. Lloyd George are vague; and he anticipated criticism of the programme that he put before the country in his speech at Caxton Hall on November 16 (from which the above quotation is taken) by using these words :—

"When you are appealing to the country there is a vast difference between a programme and detailed plans. Take any election you ever had in this country. I will take two different elections, the first when the Unionists had a great victory, and the second when the Liberals had a great victory—1886 and 1906. The Unionist leader in the one case and the Liberal leader in the other simply gave a general indication of the lines on which they were going to call for action in the new Parliament. There was no attempt to put Acts of Parliament and detailed plans before audiences. It is folly to demand it in this case, and it is not really intended."

Speaking a week later, on November 23, at Wolverhampton, the Prime Minister reverted to the subject of transportation. He said :—

"We have never made full use of our rich coalfields, and I am perfectly certain that by combined effort it would be possible to convert a good deal of that coal into electric power, which will assist in our manufactures and will enable us to provide rural industries. . . . . There is the question of improved transportation, one of the most important questions. This is essential to all other projects. Take housing. You cannot approach re-housing inside a town. Your housing schemes have got in the majority of cases to be schemes outside the town. That is your only chance to get land. . . . You must therefore even in such matters as housing have good services of tramways, light railways, lorries, and whatever enable people and goods to pass along great spaces in order to make use of the surface" of the country. . . . "It is not merely a question of carrying goods cheaply—the food and products of the farmer, the small holder, and the allotment holder—to the market. It is a question of carrying to the farmer, to the allotment holder, what he needs to cultivate his land. With a cheap, quick transportation you can regenerate rural England in such a way that you cannot do by any other means, and I consider therefore that to be one of the most important matters."

In the joint manifesto to the people of the country issued by Mr. Lloyd George and Mr. Bonar Law on November 22 the following passages occur :—

"A systematic improvement in the transport facilities of the agricultural areas must form an essential part of every scheme for the development of the resources of the soil, and the Government are preparing plans with a view to increasing these facilities on a large scale. . . . By the development and control in the best interests of the State of the economical production of power and light, of the railways and the means of communication . . . output will be increased, new markets opened out, and great economies effected in industrial production."

A "BASH ON THE HEAD."

From these and passages in other speeches it is plain that the members of the late Government have awakened to a number of facts which in peace times were urged on politicians in vain. Mr. Lloyd George, indeed, admitted it when at Wolverhampton he said :—"We got this bash on the head, and it really woke us up at last." No doubt Mr. Lloyd George was thinking of the stories which have gone round of soldiers who were incapacitated in some way—say by deafness or blindness—suddenly recovering their full faculties on accidentally receiving a severe shock.

The bash on the head, namely, the war, has led to many resultant awakenings which the late Government experienced, and which it may be hoped will have had a permanent effect in stimulating reform. Within the last few months there have been issued a series of

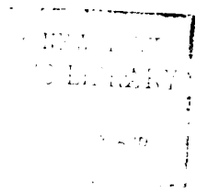
Digitized by Google

Photo by Vandyk.]

"The problem of Transportation must be taken in hand under the direct control and inspiration of the State."

THE RT. HON. LLOYD GEORGE

Digitized by Google



Digitized by Google

reports by expert Committees appointed by the Government which were calculated to illumine the most perverse darkness of politicians. These reports (abstracts of which have appeared in our pages) deal with such subjects as electric power supply, railway electrification, and the obstacles (legislative and other) which have prevented the development of tramways and light railways in this country. The last to be issued was a report (summarised on another page) of a Committee appointed to deal with the whole subject of inland transportation. The time left before the dissolution of Parliament was too short to enable the Committee to cover anything like the whole ground involved in its reference; in particular it was quite unable to tackle the subject of tramways, and it recommended that a new Committee should be appointed after the general election. The necessity for the repeal or drastic amendment of the Tramways Act of 1870 had, however, already been pointed out by a previous Committee. The Committee on Transportation were able to put forward some views on the subject of the control and working of the whole railway system of the country, and their remarks on this vastly important subject (which will be found elsewhere in this issue) ought to be carefully studied.

Railway Unification.

Many authorities in the past have advocated a system of unified control and working of the railways of Great Britain. The advantages, in fact, are admitted everywhere, and they have in the past been brought a little nearer by the amalgamation of a number of railway companies. That great economies and efficiency are possible under a unified system is agreed. It is also admitted that under post-war conditions of high wages and expensive materials there is little prospect of the railway companies working on the old methods being able to pay reasonable dividends to shareholders. The question which has always divided reformers into opposing camps is whether the unified system should be in the hands of the State or in so-called private hands. The socialistic and the individualistic arguments on the one hand and the other still wage war, and the experience which the country has had of a developed bureaucracy is by no means favourable to the railways being owned and worked by the State. There are, however, several alternatives to the project of national operation. There are two methods of unification, one being under private ownership and commercial management, and the other under nationalisation. If the latter were adopted three different methods of working are possible. One is to allow a Government department to manage the railways; a second is to constitute a board of management not directly represented in Parliament; the third is to lease the system to one or more commercial companies.

The Committee on Transport without further evidence were not in a position to recommend which method should be adopted, and they had not time before the dissolution of Parliament to take further evidence. It may be hoped that their labours will be resumed next year. The matter is a crucial one, and there should be no undue haste in coming to conclusions. The Committee should certainly hear evidence as fully as possible, not only from the advocates of nationalisation but from the railway companies and from the traders who are not doctrinaires, but who regard the matter from the business and economic point of view. The case of railway shareholders must also be fully put forward in any further investigation. They are a numerous and important body; it would be interesting to know among other things what percentage of the total adult population of the country are railway shareholders.

In regard to the possibility of unification accompanied by private ownership and commercial management, however desirable that might be from the point of view of maximum efficiency and economy, it is not probable that in these days we shall ever see one gigantic railway company owning and working the whole of the railways of the country. The cry about monopoly, oppression, and so forth would be ceaseless, no matter how well the work was done, unless there was a very full measure of State control. If a section of the public were placated by means of State ownership, then probably the best method would be to lease the system to a company, giving the State such control as might be necessary. One drawback to this arrangement, which applies also to the case of one owning company working under State control, is that there would probably be a frequent clashing of interests and policy as between the State and the company, which would not conduce to efficiency or economy. This, however, might be avoided by a careful definition of respective spheres of authority. The plan would in any case be better than a nationalised system under the dead hand of a Government department, and probably better also than nationalisation under a board of management not represented in Parliament. The latter, however, would be preferable to the former, which would be open to continual pressure in the shape of impossible demands either as to wages or as to rates for goods.

The Labour Party have no fear of a scheme of this kind. In their manifesto "to the people," issued on November 28, they demanded the immediate nationalisation and democratic control of vital public services, such as mines, railways, shipping, armaments, and electric power.

So, at the time of writing, the position stands. In these notes no attempt has been made to argue in detail on the merits or demerits of different schemes; the object has rather been to indicate the present position of matters.

The full consideration by the Government of these methods does not seem to be precluded by the statement made by Mr. Winston Churchill at Dundee on December 4 that the Government had decided on a policy of railway nationalisation. Such a policy may mean much or comparatively little; everything depends on the scheme adopted and on the methods of carrying it out. At the moment the country knows nothing of the details, and if the Government are wise these details will not be determined upon until a thorough inquiry has been made and the whole question in all its relations has been carefully explored.

RELAXATION OF CONTROL OF MATERIALS.

Dr. Addison, the Minister of Reconstruction, has announced that the position as regards the supply of materials to manufacturers is such that domestic control can now be considerably relaxed. Among the classes of work in the United Kingdom to which materials and producing capacity set free for war work should, so far as possible, be devoted in the immediate future, are the maintenance and repair of existing machinery and plant, and of railways, tramways, and roads, and the manufacture of machinery, tools, and equipment used in the public services. Applications for priority permits and other facilities should be forwarded to the same department as hitherto, and it has been arranged by the Standing Council on Post-war Priority that such applications shall receive sympathetic consideration as the altered circumstances permit.

Digitized by Google

FINAL REPORT OF THE SELECT COMMITTEE ON TRANSPORT.

In the latter part of November the House of Commons Select Committee on Transport issued two reports which are of great interest, and which should be read in the light of the recent declaration by Mr. Lloyd George that the State must take a prominent part in the development and organisation of all means of inland transport. The Committee were appointed on August 5 last for the purpose of considering what steps, if any, it is desirable to take to develop and improve the internal facilities for transport within the United Kingdom, to secure effective supervision and co-ordination, and to ensure that such developments and improvements shall be adequate and suitable to meet the national requirements, and of making recommendations.

It may be noted that on August 8 the Committee appointed a Sub-Committee to investigate and report on the facilities for transport offered by the ports and canals of Ireland. The first report of the Committee deals only with the results of this investigation in Ireland.

In their second report the Committee open by referring to the exceptionally wide scope of the reference under which they work, and to the mass of information at their disposal which is contained in existing reports of Commissions and Committees on transport questions.

The report proceeds to deal with the organisation of internal transport agencies under pre-war and war conditions.

RAILWAYS.

Under this heading the report points out that the railway system of the United Kingdom is the main branch of its internal transport agencies, because it combines the power of dealing economically with heavy traffics over long distances with flexibility of service and speed, to an extent which is not approached by any other system of transport. In this country it is unquestionable that all other forms of internal transport are subordinate and ancillary to the railway system.

The importance of the railway system is shown by the following facts. The mileage of first track open for traffic in 1913 was 23,911 miles. The total mileage of single track, including sidings, was 55,930 miles. In the same year the paid-up capital of the system was £1,334,011,000, the tonnage of goods and mineral traffic originating on the systems of the respective companies was 372,037,000 tons, and on the same basis the number of single journeys by passengers (excluding season ticket holders, who numbered 596,814) was 1,233,057,000.

The history of the main railway system of the United Kingdom has been described as one of amalgamations. It has been one of continuous absorption of smaller units by larger organisations. The recent tendency has been for the larger units in their turn to combine. The tendency has been due to a desire to promote economy of administration. The tendency in favour of combination, presumably up to the point where a single system will have been established, springs from the natural desire of the men who control the railways of the country to carry on the business of railway management in the most efficient and economical manner. This desire is one with which it is impossible not to sympathise. It appears to be inherent in the conditions in which all large-scale modern businesses are conducted, and it is extremely doubtful whether it can or should be resisted. It is obvious that the extent of co-operation at any given moment is only one of degree, and that unification is merely the final stage.

The war has considerably modified the position and methods of working of the railway companies. The changes which have been introduced and the high efficiency which has been witnessed in the working of the traffic by the railways during the war, have been due far more to a patriotic determination on the part of all concerned to do their utmost to assist the country in a time of national emergency, regardless of corporate or personal interests, than to the direct imposition by the Government of its will upon the railway companies. The success that has attended the operation of the railways throughout the war, which has been superior to that witnessed in any other of the belligerent countries, affords conclusive proof both of the adequacy of the arrangements which had been made in advance, and of the capacity of those who have been concerned with their execution.

The management of the railways taken over has been entrusted to a Railway Executive Committee composed in the first instance of nine, and subsequently of twelve general managers who were invited by the Government to serve upon it. The President of the Board of Trade is *ex officio* chairman of the Committee, but the work of the chair is in practice carried out by the acting chairman, who is one of the general managers serving upon the Committee. During the war unification of management of the railways has thus been in operation, but it has not been accompanied by unification of the ownership of the assets of the railway companies concerned.

Evidence has been given by members of the Railway Executive Committee to the effect that if a policy of unification of management, combined with a pooling of assets of the railway companies, were adopted, it should be possible to give the public better service and facilities at less cost to the railway system.

From a purely technical point of view it appears therefore to be desirable that there should be a unification of ownership, not merely unification of management, of the main railway systems, because while unification of management would undoubtedly be a great improvement upon pre-war conditions, and would assist materially to secure more efficient organisation and management, it would not, without unification of ownership, permit of the use of the assets of the combined system to the best advantage, nor allow of the provision of new and costly equipment without constantly giving rise to undesirable financial negotiations and difficulties. Whether the State, or one large joint stock concern, owned the railways would be immaterial from this point of view; the essential conditions are that there should be single ownership and single management.

The position of railway shareholders when the present arrangements with the Government terminate, under which their pre-war earnings on the basis of the year 1913 are assured to them, will obviously be one of great uncertainty. Dividends on the old scale, assuming that wages remain at a level comparable with that now existing, and the volume of traffic returns to its pre-war dimensions, cannot be earned unless either rates are raised considerably or large economies are effected in working. The former course, notwithstanding that the raising of rates might be fully justified in the circumstances, would certainly be bitterly opposed, and be detrimental to the general interests of the community. Large economies, on the other hand, can only be brought about by means of greatly improved methods of administration, and the introduction of labour-saving appliances on a considerable scale. So long as the railway companies remain as separate corporations it will be difficult to apply either method of securing economies to the fullest possible extent.

There are also other circumstances which will make it difficult from the point of view of shareholders to return to the pre-war situation. War conditions of working, and the complete elimination of competition in the public interest, have in many cases revolutionised old-established practices and habits. Traffic has been encouraged to follow unaccustomed routes, the clienteles of individual companies have been disturbed, their ideas have been changed, and the respective goodwills of the various companies have consequently been altered. Difficulties such as these seem to require solution by some process of continued unification.

The above considerations lead to the conclusion that the main railway systems of the United Kingdom should be brought under a unified ownership, and managed as one system, if the question of the improvement and development of the internal transport facilities is to be considered from the standpoint of efficiency and economy, and with due regard to the interests of the proprietors, the railway staffs, and the general community.

CANALS.

The Committee deal briefly with the subject of canals, and say that in the absence of further evidence which they desired to take had not been able to come to any conclusion in regard to the most advantageous organisation, except that further amalgamation would be advantageous.

ROAD TRANSPORT.

On this matter the Committee note that no general organisation of road vehicular transport existed in pre-war days. The railway companies are the largest individual owners of road transport vehicles. From a purely transport point of view the conditions which existed before the war were not such as to lead to economical user. The State was not directly concerned, and made no attempt by educational or other methods to influence private owners or users of road transport to combine for the purpose of introducing less extravagant methods. Little was done in this direction except by the large railway and other corporations concerned until the exigencies of the war.

In January, 1918, a Road Transport Board was appoinred by the President of the Board of Trade to co-ordinate the work of existing Government departments in connection with road transport; to determine what further measures are necessary to ensure the most economic use of road transport vehicles, and their efficient allocation; and, subject to the direction of the Board of Trade, to give executive effect thereto.

The activities of the Road Transport Board are limited by the duration of the war. Up to the present it has never had occasion to make use of its powers of compulsion. It has established an efficient organisation throughout the country which includes a large number of advisory committees representative of local interests. Its primary object has been to obtain the utmost efficiency of road transport from the existing means available, and its organisation and work have been effective in attaining this object to a very considerable extent. Competition between road, rail, canal, and other forms of transport has been reduced so far as possible where such competition has led to wasteful methods; while the voluntary co-operation of traders and owners and users of transport has been sought for schemes devised in the interests of economy. It has been the aim of the Road Transport Board to increase the efficiency of

Digitized by Google

existing transport facilities without increasing the number of vehicles on the roads.

An important feature of the work of the Board has been the initiation and institution of schemes for the co-ordination of collections and deliveries of goods, and for the provision of return loads where conditions are suitable for such arrangements. It is stated that in all these cases it has been possible to work on purely voluntary lines, and that although the economy effected in each district may appear to be slight, the saving in the aggregate is considerable.

The Committee have obtained evidence from the members of the Railway Executive in regard to the work which certain of the railway companies have carried out by means of road transport, for the purpose of providing facilities for passengers and goods in districts served by their lines. The Committee are of opinion that this work should be encouraged, and, if possible, extended, especially in agricultural districts. The Committee regret that they have been unable to pursue this important matter further. They recommend that endeavour should be made by the Government, when peace is restored, to reap for the community some of the fruits of the educational work of the Road Transport Committee by promoting voluntary co-operation between owners and users of road transport.

HARBOURS AND DOCKS.

The Committee have not been able to prosecute any detailed inquiries into the state and local conditions of the harbours and docks of Great Britain, and are accordingly unable to make any recommendations in regard to them.

TUBE RAILWAYS AND TRAMWAYS.

The Committee have not been able to study the special problems of urban and suburban traffic in London and other areas, nor to consider the parts which should be played in relation to them by tube railways, tramways, and other road vehicles.

ORGANISATION AND MANAGEMENT.

The Committee proceed to show by extracts from reports by various Commissions from 1905 to 1911 how unanimous has been the opinion in favour of unification or amalgamation. They offer some observations on the general question of unification, with a view to distinguishing clearly the various methods by which, if decided upon, a policy of unification might be brought about.

(1) Unification of the management of two or more independent systems, of which the ownership remains in different hands.
(2) Unification both of management and of ownership.
(3) Unification of ownership without unification of management.

It may be observed that (2), viz., unification both of management and of ownership of railways may be established with or without "nationalisation" of the railway system, which the Committee understand to mean acquisition by the State of the ownership of railways. As applied to the railway system of this country, the term "unification" is used in this report to denote the fusion of all the important railway undertakings of the country into one ownership, either by a private corporation or the State.

In regard to management the Committee consider that it is important to bear in mind that the management of a railway company is divided into two branches, one subordinate to the other.

(1) *The Board of Directors*, which is directly responsible to the shareholders for the custody, care, and use of their property; for the initiation and executive control of the general policy of the Company; for the finances and financial policy of the company; and for the selection, appointment, control, and dismissal of the company's staff, from its highest technical officers downward. Its members are appointed by, are responsible to, and can be dismissed by the shareholders as owners of the undertaking.
(2) *The Technical Managers*, who are responsible to the board of directors for the due execution of the policy laid down by the board; for advising the board to the best of their ability in all matters falling within their respective spheres; and for carrying out such work in relation to the selection and control of subordinate members of the staff as may be entrusted to them.

If the ownership of the railways were transferred to the State by nationalisation, some new organisation would have to be established to carry out the work hitherto performed by boards of directors. It is necessary to remember that the Railway Executive Committee are not to-day doing any of this work. The boards of directors of the railways are still discharging their duties.

CONCLUSIONS.

The Committee at this stage of its inquiry are unable to make recommendations as to the manner in which the railway system can be organised most advantageously from the point of view of the general interests of the community, or to advise as to the status and management of other transport agencies. Their conclusions upon the second of these questions must necessarily depend upon the view that may be taken as to the future position of the railways to which all the other transport agencies must be looked upon as ancillary.

The Committee are, however, in a position to state the following preliminary conclusions. The Committee consider:—

(1) That the organisation of the transport agencies of the country—and particularly of the railways—cannot be allowed to return to its pre-war position.
(2) That the temporary arrangements for the control of railways and canals during the war would not be satisfactory as a permanent settlement.
(3) That unification of the railway system is desirable under suitable safeguards, whether the ownership be in public or private hands.

Any one of the following courses would be consistent with the conclusions stated in the preceding paragraph, but without further evidence the Committee are not in a position to recommend which of these methods should be adopted in the first instance:—

(1) Further amalgamations of railway companies as a step towards unification.
(2) Unification accompanied by private ownership and commercial management.
(3) Unification by means of nationalisation followed by:—
  (*a*) Establishment of a Government department to manage the railways.
  (*b*) Constitution of a Board of Management not directly represented in Parliament.
  (*c*) Leasing of the system to one or more commercial companies.

GOVERNMENT SUPERVISION AND REGULATION OF THE TRANSPORT SYSTEM.

The means by which efficient supervision and regulation of transport agencies by the Government can be best secured will become a matter of extreme importance. The question is one that presents many and great difficulties. A large number of differences which arise between railway companies and the public are not administrative in character. They concern policy, and are usually business, not legal questions. They have to do largely with the application of judgment to matters of fact, and no fixed standards exist which can be applied to their solution. The questions whether the increases of rates charged for the carriage of particular commodities are reasonable, or whether reasonable facilities are being provided, are of this nature. Such differences were referred in the first instance to the courts of law, which were obviously not well suited to decide matters of a business character. When that remedy failed other tribunals were constituted.

Under proposals based on the recommendations of Mr. Russell Rea's Committee of 1911, customers of the railway companies would be assured of the maintenance of rates, fares, and facilities at their pre-war levels and standards, except in cases where the management might be successful in establishing before the Railway and Canal Commissioners that any proposed change was reasonable.

The Committee regret that they have not been able, for want of time, to study these questions in detail. In particular they desired to inquire in what directions and to what extent the interests of the public might be better protected.

IMPROVEMENTS OF TRANSPORT SYSTEM.—THE GATTIE SYSTEM.

The Committee devoted some time to an examination of Mr. A. W. Gattie's proposals for improving the methods of handling goods and traffic by the use of his system and inventions. The proposals are certainly attractive, and the inventions are highly ingenious, but the Committee find it impossible, on the evidence which has been presented, to come to any conclusion in regard to the practical value of the proposals, or to make any recommendation in regard to their adoption. Before any such steps could be taken it would be necessary in the first place to obtain expert tests of the working results of the various items of the apparatus, and of the operation of the sorting appliances as a whole on a practical scale.

The Committee have been informed by Mr. Gattie that his company desire to erect at their own cost an experimental plant, but that the request of his company for permission to issue for this purpose new capital to an amount of not less than £100,000 has not yet been acceded to by the Treasury New Issues Committee. While the Committee recognise that capital so employed would be devoted to a highly speculative use, they nevertheless recommend that permission to raise the funds required be given, and that such priorities be granted as may be necessary to allow the machinery and appliances to be obtained as soon as possible. They recommend that this matter should be further considered by the Select Committee which they suggest in the concluding paragraph of this report should be set up in the next session of Parliament.

CANALS.

Extensive and very costly proposals for the improvement of the canal system were made by the Royal Commission on Canals. It is clear to the Committee that proposals which would involve the expenditure of £38,000,000 for the improvement of property which is at present valued at £6,000,000 would have to be supported by most convincing evidence as to the benefits that might be reasonably expected to follow from their adoption, as to the character and extent of the traffic to be carried, and as to the financial returns which might be anticipated.

Digitized by Google

The necessity for searching inquiry upon these points is the more necessary because nearly half of the traffic carried on the canals in the Midlands in pre-war days consisted of coal. In dealing therefore with suggestions for improvement of the canal system regard will require to be had to the profound alterations in the conditions affecting the internal coal traffic of the country which will take place if effect be given to the proposals now under consideration for an immense extension of the electrical power supply system of the United Kingdom, which will involve the concentration of the generating plant at about 16 centres. The new super-stations will have to be erected at places where large supplies of water are available, generally in the vicinity of large estuaries, and in the majority of cases it may safely be assumed that their coal supplies will reach them by river transport. The necessity therefore for canal transport for the coal supplies now required for power production at inland centres like Birmingham may largely disappear.

On the other hand the Committee are justified in concluding that the canals will continue to play a useful part in the transport system of the country, and that expenditure upon a more modest scale for the purpose of maintaining them in an efficient state, and of effecting certain local improvements, will probably be found to be justified.

OTHER TRANSPORT FACILITIES.

The Committee regret that they have only been able to commence inquiries into the very important questions which are concerned with the provision of transport facilities for agricultural and rural development.

In conclusion, the Committee recommend that the inquiry into the whole subject of transport should be resumed by a Select Committee at the earliest possible date in next session of Parliament.

TRAMWAY AND OMNIBUS WORKERS' CLAIMS.

FURTHER AWARD BY COMMITTEE ON PRODUCTION.

The award of the Committee on Production in regard to the latest wages demand on behalf of the workers in the tramway and omnibus industry has just been issued. The first clause enumerates the parties to the reference to the Committee on Production, including the Municipal Tramways Conference (representing numerous corporations), the Tramways and Light Railways Conference (representing various companies), and several omnibus undertakings on the one hand, and the National Transport Workers' Federation on the other. The subsequent clauses are appended :—

1. (This clause enumerates the parties to the reference.)
2. The claim submitted was as follows :—
   (1) That equal total payments be made to women as to men in the tramway and motor omnibus undertakings in the United Kingdom.
   (2) That the position of youths between 18 and 21 years of age shall be maintained in accordance with the award (No. 947) of the Committee on Production of March 8, 1918 (Tramway and Motor Omnibus Workers).
   (3) (*a*) That the war wages at present paid to males and females 18 years and over shall be increased by such amounts as shall give 35s. per week war wages, payment to be made on the basis of six days or six shifts.
   (*b*) That youths and girls under 18 years of age shall be paid half the total war wage paid to the employees over 18 years of age, except where youths or girls are performing adults' work, when they shall receive adults' pay.

   The claim is made on behalf of and is intended to include all employees (other than skilled craftsmen), male and female, whose Unions are affiliated to the National Transport Workers' Federation.
3. The application was referred by the Ministry of Labour to the Committee on Production for decision, and representatives of the parties were heard on November 15, 1918.
4. With regard to item (1), a similar claim was heard by the Committee on August 26 and 29, 1918, and their award (No. 2200), dated August 29, 1918, contained the following provisions :—

(7) In dealing with the claim that equal total payments be made to women as to men for equal work, it is necessary to distinguish between the elements of which these total payments are composed. The payments made to the men contain the following three elements, viz.: (1) the base rate of wage; (2) the additions made thereto since the outbreak of war by way of war bonus or war wage advance, with a view to meeting the increased cost of living; (3) the addition of 5s. per week granted under the award of July 9, 1918, as a war wage advance, to include and to be deemed to be in full settlement of any claim with respect to the bonus of 12½ per cent.

(12) As regards the items mentioned in Clause 7 of this award and numbered (1) and (2), the claim submitted covering these items is put forward in such a form as to involve the determination of a general principle applicable, if adopted and established, not only to women employed on tramways and motor omnibuses, but to women employed in many other industries. Such a principle can only be decided on a national basis, after full, comprehensive and detailed investigation, with due regard to the far-reaching financial and economic considerations involved, and after hearing all interests that would be affected, including those women (if any) engaged in other industries whose interests might be considered by them to be affected. The Committee therefore recommend that the whole question of women's wages and advances should be made the subject of a special inquiry, in which women can take part, and at which all the facts and circumstances which must be taken into account before any general guiding principle can be safely or properly formulated may be fully investigated and considered.

5. A Committee of Inquiry such as that referred to in clause 12 of award No. 2200 has since been appointed by the Government, and, having regard to the views expressed by the Committee on Production in that award and to the fact that the Committee of Inquiry has not yet issued its report, the Committee do not consider that the claim that equal total payments shall be made to men and women employed in connection with tramway and motor omnibus undertakings is one that they can now accede to.
6. Item (2) of the claim is made in consequence of the terms of the award (No. 1803) of the Committee of July 9, 1918. The claim dealt with in that award was one for payment of a bonus of 12½ per cent. on earnings, which originated in Orders Nos. 1061 and 1301 (Statutory Rules and Orders, 1917) of the Minister of Munitions. These orders provided that the bonus was to be paid only to men (of certain classes) aged 21 years and over. In their award of July 9, 1918, the Committee granted the men concerned aged 21 years and over an advance of 5s. a week in full settlement of the claim for the 12½ per cent. bonus. No advance was granted to males under 21 years, and the present claim is made in order to restore the pre-award position of males between 18 and 21 years, men 18 years and over having previously been paid the same war advances.

The award of the Committee is as follows :—

7. Item (1) of the claim is not one which can be now be conceded.
8. Item (2) of the claim has not been established.
9. To the men concerned aged 21 years and over, and to the grades of women aged 18 and over whose terms of employment include an undertaking that they shall be paid the same rates as the grades of men whose places they have filled, there shall be paid such advance as shall give 30s. a week over the pre-war rates of the grades concerned, payment to be made on the basis of a week of six days or six shifts.
10. To the men concerned aged 18 years and over, but under 21 years, there shall be paid such advance as will give 25s. a week over pre-war rates, payment to be made on the basis of a week of six days or six shifts.
11. In the case of women aged 18 years and over not covered by clause 9, the advances now being paid shall be increased by 5s. a week, subject to a maximum of 30s. a week over the pre-war rates of the grades concerned, payment to be made on the basis of a week of six days or six shifts.
12. In the case of girls and boys and youths under 18 years of age the advances now being paid shall be increased by such amount per week as shall give the girls, boys, and youths under 18 years of age in the undertaking concerned half the additional advances given by this award to the men or women, as the case may be, in the same undertaking.
13. The amounts hereby awarded are to be taken into account in the calculation of payment for overtime and night duty and for work on Sundays and holidays; they are to be regarded as war advances and are to be recognised as being due to and dependent on the existence of the abnormal conditions prevailing in consequence of the war.
14. This award shall not apply to classes of employees, such as building trades operatives, whose wages have customarily been regulated by the movements in the wages of the trades in which workmen of the same classes are ordinarily employed.
15. This award shall apply only to women to whom the provisions of the Orders made by the Minister of Munitions under the powers conferred upon him by the Munitions of War (Amendment) Act, 1916, have not been applied.
16. So far as the London General Omnibus Company are concerned this award is applicable only to those grades of employees with respect to whom there are agreements between the Company and the London and Provincial Union of Licensed Vehicle Workers; but the award does not cover, and is not to be deemed to cover, the grades of employees dealt with in the agreement between the Company and the Union of April 11, 1918.
17. The claim that youths and girls performing adults' work shall receive adults' pay has not been established.
18. This award shall take effect from the beginning of the first full pay in November, 1918.

WALWORTH H. ROBERTS.
JOHN M. DENNY.
F. S. BUTTON.

H. J. WILSON, Secretary,
5, Old Palace Yard, S.W.1.
November 21, 1918.

Triplex Safety Glass is commended to the motoring trade and public as an unsplinterable glass, the particular merit claimed being that of unsplinterableness. It is excellently adapted for windows and wind screens of motor cars. It consists of two thicknesses of glass with a layer of xylonite between. Glass and xylonite are united by a secret cement and hydraulic pressures. The resulting substance is safe and as transparent as ordinary glass. It is stated that the War Office and the Admiralty are commandeering all the available output of the Triplex works, but requisitions for peace time can be received by the Triplex Safety Glass Company, Limited, 1, Albemarle Street, London, W.1.

Digitized by Google

TRAMWAY CHAIRMEN FOR 1918-19.

Municipal Tramways Committees have now been constituted for the ensuing year, and we append a list of the chairmen and vice-chairmen. In all but a very few cases those who held office last year have been re-elected. New appointments are indicated in the list by an asterisk.

Town.	Chairman.	Vice-chairman.
Aberdare	Coun. E. Stonelake ...	
Aberdeen	*Dean of Guild Meff. ...	
Accrington ...	Ald. T. E. Higham ...	Coun. T. Morley.
Ayr	Coun. J. R. Learmont	Bailie T. Murray.
Bacup	Ald. Sir J. H. Maden...	Coun. J. H. Lord.
Barking	*Coun. J. Ranson ...	
Batley	Coun. F. W. H. Auty	Coun. J. E. Oldroyd.
Belfast	Coun. W. G. Turner ...	Coun. Jas. McDonald.
Birkenhead ...	Coun. H. Halsall ...	Coun. R. Frame
Birmingham ...	*Coun. Lee	
Blackburn	Ald. W. Thompson ...	Coun. C. Higham.
Blackpool	Coun. R. Holt	Coun. H. Brooks.
Bolton	Coun. P. Higson ...	Coun. J. R. Horrocks.
Bootle...	Ald. Booth	Coun. E. Pennington.
Bournemouth ...	Coun. F. J. Bell... ...	Coun. W. J. McCabe.
Brighton	Coun. T. J. Braybon...	
Burnley	Coun. E. Heap	Coun. D. D. Irving.
Burton-on-Trent	Ald. Rowland	Ald. Lowe
Bury	Ald. Collinge	Coun. Hargreaves.
Cardiff	Ald. Sir J. W. Courtis	*Ald. R. J. Smith.
Chester	Ald. J. Jones	Coun. A. S. Dutton.
Chesterfield ...	Ald. Shentall (Mayor)	Coun. Woodhead.
Colchester	Coun. Jarmin (Deputy Mayor)	Coun. G. F. Wright (Mayor).
Colne	Coun. R. Knight ...	
Coventry	Coun. H. W. Wale ...	Coun. J. Grant.
Croydon	Coun. A. A. Thomson	Coun. G. J. Allen.
Darlington ...	Ald. Sir Chas. Starmer	
Dartford	Coun. R. Bennett ...	Coun. W. J. Bourne.
Darwen	Coun. G. Pickup ...	Coun. Butterworth.
Derby	*Coun. Eaton	
Doncaster	Coun. S. Balmforth ...	*Coun. T. Bramworth.
Dundee	Coun. G. A. Johnston	
East Ham	Ald. Murrell Oakes ...	
Erith	Coun. G. C. Humphreys	
Exeter	Ald. H. B. Varwell ...	Coun. F. G. Towill.
Glasgow	*Coun. Kelly	*Coun. M'Whirr.
Gloucester	Coun. J. O. Roberts ...	Coun. C. J. Ramstedt.
Great Yarmouth	Ald. J. T. C. Salmon	*Ald. McCowan.
Halifax	Ald. C. F. Spencer ...	Ald. A. Fawcett.
Haslingden ...	Coun. Waddington ...	Coun. Haworth.
Heywood	Ald. J. Ashworth ...	Ald. T. Popple.
Huddersfield ...	Coun. E. H. Sellers ...	Coun. T. Canby.
Hull	Coun. W. Hakes ...	Coun. C. Raine.
Ipswich	Coun. E. C. Ransome (Mayor)	*Coun. W. P. Burton.
Keighley	Coun. A. Smith ...	
Kilmarnock ...	Coun. R. Lorimer ...	
Kirkcaldy	Coun. G. Fergusson ...	
Lancaster	Coun. T. Wilkinson ...	
Leeds	Ald. R. A. Smithson ...	Ald. H. Brown.
Leicester	Ald. S. Flint	Ald. G. Banton.
Leith	Bailie Goalen	
Leyton	Coun. F. M. Read ...	
Lincoln	Ald. W. S. White ...	
Liverpool	Ald. E. Russell-Taylor	Ald. F. Smith.
Lowestoft	Coun. F. Spashett ...	
Maidstone	Ald. D. T. J. Lyle ...	Coun. Green.
Manchester ...	Ald. J. Bowes	Ald. A. W. Chapman.
Newcastle-on-Tyne	Coun. R. Mayne ... (Deputy Lord Mayor)	Coun. A. M. Sutherland (Lord Mayor).
Newport	Coun. J. Moxon ...	Ald. F. Phillips.
Northampton ...	Coun. T. D. Lewis ...	Coun. W. Beale.
Nottingham ...	Coun. R. H. Swain ...	Ald. F. R. Radford.
Oldham	Coun. J. K. Cheetham	
Perth	Coun. Calderwood	
Plymouth	Ald. T. Baker	Coun. J. Moon.
Preston	Ald. J. Ormrod	Coun. T. Parkinson.
Radcliffe	Coun. J. H. Lund ...	
Rawtenstall ...	Ald. H. Coupe	Coun. J. W. Stansfield.
Reading	Ald. C. G. Field ...	
Rochdale	Ald. Taylor	
St. Helens	Coun. Rudd	
Salford	Ald. H. Linsley	Coun. W. H. Barrett.
Sheffield	Ald. Sir W. Clegg ...	Ald. W. C. Fenton.
Southampton ...	Ald. F. A. Dunsford	
Southend	Coun. G. Radford ...	
Southport	Coun. E. Clayton ...	Coun. T. S. Richardson
Swindon	*Coun. Horder	*Coun. Stevens.
Wallasey	Coun. F. E. Howse ...	Coun. H. W. Griffin.
Walsall	Ald. J. Cope	Ald. J. Williams.
Walthamstow ...	Coun. W. R. Clarke ...	
Warrington ...	Coun. Dr. G. W. Joseph	Ald. J. Wilkinson.
West Bromwich	Ald. A. G. Turley ...	Ald. G. Garratt.
West Ham ...	Coun. Kensett ...	
Wigan...	Ald. R. T. Fletcher ...	Coun. Jas. Walkden.
Wolverhampton	Ald. Sir C. T. Mander	
York	Ald. S. W. Meyer ...	Coun. W. H. Sessions.

EIGHT-HOUR DAY FOR RAILWAYMEN.

THE FINANCIAL EFFECT ON WAGES.

Signs became apparent during the first week in December that the extremists amongst the railway workers were intent upon forcing a decision upon the main items of the railway unions' national programme, notably the claim for an eight-hour day. This claim was practically conceded by Sir Albert Stanley, President of the Board of Trade, in making the settlement with the Unions on the occasion of the trouble in August last.

The feature of the present settlement was the prompt measures taken for preventing a recourse to a strike, which would have been a national danger and might have had a serious effect upon the position. Mr. J. H. Thomas, P.C., secretary to the National Union of Railwaymen, issued an appeal to the men not to endanger the negotiations which were about to be entered upon now that the war had been concluded, and Sir Albert Stanley arranged to meet the delegates from the two unions at midday on Friday, December 6. Earlier in the day, however, Sir Albert was sent for by the Prime Minister, who had been considering the question with the members of the War Cabinet.

Sir Albert's arrival at the Board of Trade was delayed until 12.20, when he first received Mr. Bromley, the secretary of the Associated Society of Locomotives, and afterwards he was waited upon by Mr. Thomas and the delegates of the National Union. Mr. Bromley stated to the reporters :—

Sir Albert Stanley has announced that the Government have conceded the principle of an eight-hour day, to take effect from February 1 next. In the interim a committee is to be set up, consisting of representatives of the Board of Trade, the railway companies, and the railway unions, which, it is hoped, will arrive at an agreement on the question of wages and the general conditions of work. I am satisfied that, in the circumstances, the Government have done all they can to satisfy the men. It is to apply to the electric motormen as well.

Mr. J. H. Thomas said that he considered the settlement extremely satisfactory, reflecting credit upon the Government, and especially on Sir Albert Stanley, who showed a generous desire to get over a real difficulty as promptly as possible.

The following official statement was made by Sir Albert Stanley :—

(1) The principle of an eight-hour day for all members of the wages staff has been conceded, and is to come into operation on February 1 next.

(2) All existing conditions of service are to remain unaltered pending the decision of a committee to be set up as soon as possible, to review wages and other conditions of service of railwaymen in Great Britain and Ireland.

To the representatives of the newspapers Sir Albert Stanley said :—

"The negotiations have been carried on in a very friendly spirit. This decision of the Government, so warmly supported by the Prime Minister and myself, is in fulfilment of a pledge which I gave to the railwaymen's unions on August 21, 1917. That pledge was to the effect that sympathetic consideration would be given to the introduction of a shorter working day for the railwaymen at the earliest possible moment. I am very glad to have had the privilege of redeeming this pledge, and I hope, and am confident, that it will be recognised by the railwaymen as some reward for the magnificent services which they have rendered during the war."

The decision means (says *The Times*), not that the railwaymen will always work only eight hours a day, but that when work beyond that limit is necessary it will be paid for as overtime. The men expect the overtime rate to be time and a quarter. The financial effect of the change on the railway wages bill is estimated to be as follows :—

Pre-war wages	£47,000,000
War Bonuses	55,000,000
Cost of eight-hour day	25,000,000
Year's total	£127,000,000

The Railway Executive Committee, which took no part in the negotiations with the men, met later to consider the measures to be taken to give effect to the Government decision.

D.O.R.A. and Lights.—Certain orders made under the Defence of the Realm Act in regard to lights were cancelled by an Order in Council issued in the first week of December, but the Orders relating to lights on vehicles were retained for the time being.

Digitized by Google

DICK, KERR & COMPANY, LIMITED.

ANNUAL MEETING—A PROSPEROUS YEAR AND ENCOURAGING PROSPECTS.

The ordinary general meeting of the shareholders of Dick, Kerr and Company, Limited, was held at the Cannon Street Hotel, Cannon Street, London, E.C., on Thursday, November 14, 1918.

The chairman, Mr. Claud T. Cayley, presided, and was supported by the following directors:—Messrs. R. H. Prestwich (deputy chairman), David C. Ellis, Bernard A. Firth, John Sampson, C.B.E., Thos. D. Lingard, G. Mure Ritchie, and Walter Rutherford (managing director).

The secretary (E. D. Johnson) having read the notice convening the meeting and the report of the auditors, Messrs. Gane, Jackson, Jefferys & Freeman,

The CHAIRMAN said: You have all had the balance sheet and directors' report in your hands for some days. I will ask you if you will take it as read and will proceed immediately to my speech. You will have already seen that the profit for the year under review is not much short of that for the previous year, and in view of the fact that your directors' policy has been gradually to prepare, where possible, for the reconstruction of the business on post-war conditions, no doubt you will consider the year's result satisfactory. The total on the asset side of the balance sheet is this year over two and a quarter million pounds, which is a record figure so far as this company is concerned. The individual items which make up this total are in the main not widely different to those of last year, with the exception of the asset "contracts, due for work, stock of materials, etc.," which is roughly £100,000 more than it was in 1917. Without going into details I might explain that this item covers the sums due to the company in respect of our various contracts, together with the stock of material carried in respect of them and so forth, and is naturally bound to fluctuate from year to year. You will notice that the asset "capital expenditure" is some £20,000 less than last year, and we do not doubt that you will fully endorse the conservative policy of which this writing down is evidence. Investments stand at £338,000 odd, as against £341,000 odd in 1917. This decrease, however, is the net result of two larger transactions. You will remember that last year I reported on the acquisition of the bulk of the "B" preference stock of Willans and Robinson, Limited, partly by cash and partly by exchange of shares, which, as you will see by referring to the share capital on the other side of the balance sheet we issued for this purpose. This transaction occurred after the close of our financial year, and was therefore not reflected in the 1917 accounts. On the other hand, since our last meeting, the whole of our holding of the preference shares of the United Electric Car Company, Limited, has been disposed of, so that the latter transaction largely offsets the former. On the liability side of the balance sheet the chief variation (other than the issue of shares indicated) is that the item "creditors and estimated liabilities" shows a decrease of approximately £90,000. The special reserve for contingencies stands in the balance sheet at £75,000, and to this your directors propose to add a further £25,000, making a total of £100,000. This reserve has been made with a view to providing any further sums which may be necessary in connection with special war taxation, or, of course, to meet any other contingencies which may occur, such as the reorganisation for peace conditions.

The works have continued to be fully employed, and I am glad to say that during the past few months the demand for certain purely war products having become less urgent, opportunity has been taken to establish a process of gradually changing over, and in this connection it is pleasing to note that the Ministries of Munitions and Reconstruction, remembering perhaps the way in which we threw ourselves wholeheartedly into the production of war material in the early days, have given considerable assistance. While, therefore, there must inevitably be a hiatus of disorganisation, we hope to be able to retain the continuous services of a considerable portion of our workpeople, first of all in the operations necessary to rearrange the factories, and later in standard production, provided raw material is available. In this connection I would like to emphasise that the raw material required for the class of machinery in which we specialise is very different from raw material as understood generally by the public. Material such as steel forgings and castings, copper wire, and many other things which are the basis of our manufacture, are the finished article with many other producers, upon which months of work must already have been expended before they arrive at our stores.

During the year the work of consolidating into our own organisation those of Willans and Robinson, Limited, and the United Electric Car Company, Limited, referred to in my speech last year, has been completed, and your management committee has been strengthened and made still more representative by the appointment of Mr. Davenport and Mr. Bennett, from Rugby, and Mr. Conner, whom many of you know well as an old and trusted member of our staff. An alliance has also been made with Siemens Brothers and Company, Limited, by which it is thought that much economy can be attained through the amalgamation of selling organisations and co-ordination of designs and products so as to avoid over-lapping. Siemens and ourselves are not competitors in manufacture. They, as is well known, are long established as makers of all kinds of cables, from submarine telegraph to power transmission, dynamo machinery, telephones, instruments, and so on, while we have specialised in apparatus for railways and tramways, steam turbines, and the larger classes of electrical machinery. The two manufacturing organisations dovetail into each other perfectly, and only small adjustment is required to bring the commercial sides together with material benefit to both. This arrangement was referred to by Mr. Mure Ritchie, the chairman of Siemens Brothers, Limited, in his speech to the shareholders of that company in June last, and it has now been consummated by an exchange of directors, Mr. Mure Ritchie having taken a seat on this board, and I having joined that of Messrs. Siemens.

An interesting development which has taken place since our last meeting is the establishment in France and in Japan of companies to exploit our manufacturing rights in connection with apparatus for railways and tramways. It must be gratifying to you to know that Dick-Kerr machinery ranks so highly in these important countries that representative technical and business men are willing to provide the considerable capital required for such undertakings. These companies will also act as our agents in their respective countries, thereby contributing important outlets for the products of our own factories, should there be a surplus available. It is obviously inadvisable to make public the details of our arrangements with these companies, but the terms are considered by your board to be satisfactory. I referred last year to the conviction on the part of those studying the position on your behalf that the after-war demand for our products will be very great. The correctness of this opinion is proved by the demand which already exists for all classes of electrical machinery, and especially large sized steam-turbine generating plant, upon which we have specialised for some years.

It has further been brought home to your management that the manufacturing capacity of the country for heavy electrical machinery is much below the demand, and that in our own case we must, if we wish to retain the position we hold at present, find facilities not only for increased output but also for the production of individual units larger than our present shops admit of. Having reached this conclusion, we were faced with the difficulty, if not the impossibility, at all events for a long time to come, of extending the works, obtaining the necessary machinery, and building up a strong organisation. It is therefore with pleasure that I have to inform you that we have solved the difficulty in a very satisfactory manner. We were in hopes that we would be in a position to give you full details at this meeting, and indeed the date was postponed with this in view. The arrangements which are involved, however, require much careful adjustment, together with Treasury sanction, which has not yet been received. Suffice it to say, therefore, that an option agreement has been entered into with the Coventry Ordnance Works, Limited, who own an engineering works of modern design and equipment which, although not at present occupied upon electrical work, can very quickly be converted to that purpose. You will in due course receive full particulars of the proposal, and you will be asked to consent to an exchange of your shares for those of a new company, which, in the event of the offer being accepted, will control both concerns. The Coventry Ordnance Works, Limited, which is not a public company, has an issued capital of £800,000 and debentures of £600,000. Its proprietors are Messrs. John Brown and Company, Limited, Messrs. Cammell, Laird and Company, Limited, and Messrs. Fairfield Shipbuilding and Engineering Company, Limited. The shops which were laid down for the purpose of making heavy armament, are modern both in respect of design and equipment, and, as I have already said, can be easily altered for the production of heavy electrical machinery. In addition to the armament business done by the company, they have also a considerable output of non-war material, which it is expected can be materially increased. Full particulars will be sent you in due course, and I will therefore ask you now to be good enough to await these particulars, as I am not at the moment in a position to give any details.

I shall now put the resolution in regard to the report and the balance sheet as follows:—"Resolved that the audited accounts for the year ended June 30, 1918, together with the report of the directors thereon, be and they are hereby adopted, that the payment of dividend on the ordinary shares for the same period of 10 per cent. is hereby sanctioned, and that the payments made on the dividends of the preference shares are hereby confirmed."

The motion was seconded by Mr. R. H. PRESTWICH, and carried unanimously.

The CHAIRMAN: The next item on the agenda is to re-elect two retiring directors, Mr. R. H. Prestwich and Mr. John Sampson. Mr. Prestwich has been a director of the company for many years and is, I think, one of our largest shareholders. Mr. Sampson has also been on the board for some years and I cannot say too much as to the valuable services he has rendered as a practical engineer. I beg to propose the re-election of Mr. Prestwich and Mr. Sampson, and I will call upon Mr. T. D. Lingard to second that.

Digitized by Google

Mr. LINGARD: I have great pleasure in seconding the resolution.

The resolution was put and carried unanimously.

Mr. PRESTWICH: I beg to thank you, gentlemen, on behalf of my colleague and myself, for your renewal of confidence. I can only assure you that it is always a pleasure to us to do whatever we can for the firm with which we have been so long associated, and we shall promise to do that in the future.

The CHAIRMAN: The next item is the confirmation of two directors elected during the year. Mr. Bernard A. Firth, of Messrs. Thomas Firth and Sons, of Sheffield, and Mr. Muir Ritchie, chairman of Messrs. Siemens Brothers, Limited. I ask you to confirm what the directors have done during the year in electing these gentlemen on the board. I have very much pleasure myself in submitting it. I do not think I need propose it, and beg to put it to the meeting if you approve of their election being confirmed.

Mr. PRESTWICH: I have great pleasure, gentlemen, in asking you to confirm what we have done in the election of these two gentlemen on the board. I am sure you will feel that the list of directors is very greatly strengthened by their coming on. Therefore I have much pleasure in seconding the resolution.

The Chairman then put the motion to the meeting, and it was carried unanimously.

The CHAIRMAN: The only other motion comes from the other side of the table, and that is the election of Messrs. Gane, Jackson Jefferys, and Freeman.

Mr. T. BARBER GLENN: I have very great pleasure in moving that Messrs. Gane, Jackson Jefferys, and Freeman be re-elected auditors of the company. They have been our auditors I think since the start of the company. They are well known in the City of London and to me, and I am sure we cannot be in better hands.

Mr. DAVIDSON seconded the resolution, which was carried unanimously.

Mr. FREEMAN: I am much obliged to you for associating my name with a firm which has done such excellent service during the war and in other ways during the last few years, and which I am sure you will recognise from a speech of the chairman is going to do equally good work in the reconstruction of the business now before us.

Mr. WILKINSON: I do not think we ought to conclude the meeting without a vote of thanks to the board, who not only have done very assiduous and complicated work, but exceedingly difficult work this year under the circumstances in which business has been carried on. I hope that the meeting will agree that we ought to express our great gratitude for all the work which has been put into the operations on land or elsewhere by the board and those who have been working under the board.

Mr. T. BARBER GLENN: I should like to second the vote of thanks. We are all very grateful to you for the very careful management of the company, and I think that our thanks are due to the directors, to the management committee, and to Mr. Walter Rutherford, the managing director.

The motion was put to the meeting and carried unanimously.

The CHAIRMAN: I wish to thank you all, the proposer and the seconder of the resolution, for the kind remarks made in reference to the board and the staff. We much appreciate the fact that you have appreciated our efforts.

The report for the twelve months ended June 30, 1918, shows that the company has again had a prosperous year. The dividend of 10 per cent. is maintained on the ordinary shares, and a balance of £37,860 is carried forward, which is somewhat larger than the amount brought forward last year. As in each of the previous three years, a sum of £25,000 has been set aside to supplement the special reserve for contingencies. The net profit at £87,916 is lower than in the previous year, but the difference may be accounted for by the higher allowance made for excess profit tax. The total sum available is £123,989, which has been allocated as set out in the table below, in which a comparison is given with the results of the four preceding years:—

	1918.	1917.	1916.	1915.	1914.
	£	£	£	£	£
Net profits	87,916	95,465	71,740	46,959	44,761
Balance from last year	36,073	20,397	18,347	25,526	10,325
	123,989	115,862	90,087	72,485	55,086
Debenture interest and trustees' fees ...	9,829	10,188	10,490	10,538	10,961
Premium on debenture stock redeemed	300	300	300	300	300
Dividend on 6 per cent. pref. shares ...	21,000	18,300	18,300	18,300	18,300
Dividend on ordinary shares	30,000 (10%)	26,000 (10%)	15,600 (6%)	—	—
Reserve against contingencies	25,000	25,000	25,000	25,000	—
Balance carried forward	37,860	36,073	20,397	18,346	25,525

FINANCIAL REPORTS AND MEETINGS.

DIVIDENDS.

CAPE ELECTRIC TRAMWAYS.—5 per cent. for year ended June 30.

VERA CRUZ ELECTRIC LIGHT, POWER AND TRACTION.—5 per cent. for 1917.

UNITED ELECTRIC TRAMWAYS COMPANY OF CARACAS.—7 per cent. less tax for the year ended June 30.

SIEMENS BROTHERS AND CO. LIMITED.—Interim at the rate of 10 per cent. per annum, free of tax, is announced.

CALCUTTA TRAMWAYS COMPANY.—Interim on the ordinary shares at the rate of 2½ per cent. (2s. 0d. per share), free of tax.

BRITISH COLUMBIA ELECTRIC RAILWAY COMPANY, LIMITED.—5 per cent. on the cumulative perpetual preference stock.

PEASE AND PARTNERS.—An interim dividend of 10s. per share, free of income tax, 5 per cent. for the half year, has been paid.

BABCOCK AND WILCOX, LIMITED.—Interim on the ordinary shares for the half year at the rate of 12 per cent. per annum, free of tax.

CITY OF BUENOS AYRES TRAMWAYS COMPANY.—5 per cent. per annum (1s. 3d. per share) less tax for three months to September 30.

INDIAN ELECTRIC SUPPLY AND TRACTION COMPANY.—2½ per cent. interim, being at the rate of 5 per cent. per annum, the same as a year ago.

BRITISH ELECTRIC TRACTION.—The directors announce a dividend on the 6 per cent. cumulative preference stock for the half year to September 30.

CHLORIDE ELECTRICAL STORAGE COMPANY, LIMITED.—A dividend of 5 per cent., free of tax, on the ordinary shares—the same as last year—is announced.

CAPE ELECTRIC TRAMWAYS, LIMITED.—A dividend of 5 per cent. on the share capital has been declared, £12,000 has been placed to reserve, and £5,830 carried forward.

BRUCE, PEEBLES AND CO. LIMITED.—At the rate of 7½ per cent. per annum, less income tax, on the cumulative participating preference shares, for the half year ended June 30.

CITY OF BUENOS AYRES TRAMWAYS.—1s. 3d. per share (being at the rate of 5 per cent. per annum), less tax, for the three months ended September 30, the same as a year ago.

THE A.E.G. OF BERLIN.—The directors estimate that the profits for the year 1917-18 will be sufficient to enable the company to pay a dividend of 14 per cent. For the previous year 12 per cent. was paid.

STIRLING AND BRIDGE OF ALLAN HORSE TRAMWAY COMPANY.—The annual report of this, the only remaining horse tramway company in the kingdom, shows that last year the revenue amounted to £5,838 15s. 10d., and the expenditure to £5,363 4s. 2d. The income is £430 better than the previous year, and the expenditure £172 12s. less, but no dividend is declared.

NEW SOUTH WALES GOVERNMENT RAILWAYS AND TRAMWAYS.—The annual report for the year ended June 30 includes statistics as to tramways as follows:—Earnings £1,992,641, decrease £15,898; working expenses £1,603,260, decrease £88,107; interest on capital cost £348,546, increase £13,185; passengers 255,740,808, decrease 39,562,902; car mileage 21,762,244, decrease 3,599,748; mileage of lines open 225½, increase 1½; percentage of working expenses to earnings, 80·46, decrease 3·75.

HURST, NELSON AND COMPANY, LIMITED.—The report for the year to July 31 states that there was a net profit of £56,763. A dividend of 10 per cent. on the ordinary shares, or a bonus of 5 per cent., free of tax, is recommended, with the placing of £20,000 to general reserve (making £90,000 in all), and the reserving of £12,000 for payment of half-yearly dividend on preference shares in May, and an interim dividend at the rate of 5 per cent., free of tax, on the ordinary shares, and the carrying forward of £20,843.

YORK CORPORATION TRAMWAYS.—The accounts for the year ended March 31 show that the tramways income (apart from omnibuses) amounted to £42,041, or 11·7d. per car mile, as against £37,636, or 10·91d. per car mile in the preceding year. The revenue from omnibuses also showed an increase, being £3,180, or 9·32d. per car mile, compared with £2,560, or 7·98d. per car mile. The following is a comparison of the car mileage in the two years 1916-17 and 1917-18:—Omnibuses, 76,993, 81,843; cars, 826,283, 862,530. The revenue showed an increase of just over £5,000 on the preceding year. There was an increase in the expenditure which amounted to £38,449, as against £30,938, chief items being wages of motormen and conductors, £2,342; general repairs and maintenance, £2,000; and electrical power, £1,394.

WALLASEY CORPORATION TRAMWAYS.—The accounts for the year ended March 31 show a traffic revenue of £82,024, which, with £450 received from advertisements and sundry small sources of income, gave a total revenue of £82,562. Traffic accounts amounted to £20,697, including £15,240 for wages. General expenses totalled £6,625 and repairs and maintenance £7,664. The cost of current at 1s. 4d. per B.T. unit was £11,935. War service allowances

Digitized by Google

accounted for £2,040, and war bonuses to employees for £4,830. The total of working expenses was £54,397. There was a balance carried to net revenue account of £28,164, out of which contributions were made to interest on loans and sinking and reserve funds, and £11,000 was allocated to the borough fund in aid of the rates, being the largest amount yet available for that purpose, as compared with any previous year.

BRADFORD CORPORATION TRAMWAYS.—A statement has been submitted to the Bradford Tramways Committee as to the six months from April 1 to September 30, in comparison with the results of the corresponding period of the year preceding. The receipts were £243,280, as compared with £203,592, an increase of £39,688, which is largely accounted for by the fact that during four months increased fares have been charged. Owing to various circumstances the number of car miles run has fallen from 2,858,344 to 2,573,434, a decrease of 284,910. The number of passengers carried has also dropped from 42,893,176 to 40,136,206, a decrease of 2,756,970. The receipts per car mile have risen from 16d. to 21·18d. Wages have risen to £114,072, as compared with £90,695. The allowances paid to dependents of sailors and soldiers, which are included in the wage totals, were £15,218, as against £9,943.

CHRIST CHURCH (NEW ZEALAND) TRAMWAY BOARD.—The report for the year ended March 31 shows a record revenue, £160,682, an increase of £10,186 on the previous year. As compared with the last pre-war year, 1913-14, the earnings increased by £19,503. The surplus last year amounted to £5,685, as against £5,191. The increase of £10,186 in earnings was nearly all swallowed up in increased operating expenses, which were £8,571 more than in the previous year. Traffic expenses, due to increased mileage and increased wages, were £5,267 more. Repairs and maintenance account was £4,334 higher, chiefly owing to increased cost of materials although the increasing age of the cars contributes. On the question of advertising, the report says :—" Opinions may differ as to whether tramcars should be used for advertising purposes, but the net receipts from this source (£1,716) are substantial and cannot be ignored."

CROYDON CORPORATION TRAMWAYS.—As will be seen from the appended summary of the accounts for the past four years, the position of this undertaking shows a great improvement. The report of the manager, Mr. T. B. Goodyer, shows that the deficit of 1917 was converted in the year ended March 31, 1918, to a substantial profit. The margin was sufficient to allow of a sum of £11,221 to be carried to the reserve and renewals account. The balance carried to net revenue account was £12,000 greater than in the previous year, while the net profit showed an increase of nearly £12,800 in spite of a large increase in working expenses. War allowances at £5,801 are about the same as in the previous year. The receipts per car mile increased from 10·49d. in 1917 to 11·95d., the expenses per car mile being 8·576d. as compared with 8·259d. The ratio of expenses at 69·71 per cent. was 6·21 per cent. lower.

	1918	1917	1916	1915
	£	£	£	£
Income—				
Traffic revenue	109,542	88,596	93,403	87,833
Sundry receipts	1,006	990	1,013	781
Total income	110,548	89,586	94,416	88,614
Expenditure—				
Traffic expenses	28,452	26,179	29,388	30,270
General expenses	8,815	8,186	7,642	7,122
Repairs and maintenance ...	15,243	15,256	13,228	14,128
Power expenses	20,889	18,809	20,344	17,684
War bonus, etc.	5,227	1,284	1,907	1,104
Total working expenses	78,626	69,714	72,509	70,308
War allowances	5,801	5,824	4,982	1,974
	84,427	75,538	77,491	72,282
Balance carried to net revenue	26,121	14,048	16,925	16,332
Interest, etc.	2,613	2,249	1,353	749
	28,734	16,297	18,278	17,081
Deductions—				
Interest	7,772	7,851	7,903	7,889
Income tax	2,343	2,624	2,076	1,587
Net profit	18,619	5,822	8,299	7,605
Appropriated as follows :—				
Sinking fund	5,730	5,787	5,787	5,747
Instalment of loan	1,668	1,668	1,668	1,668
Reserve and renewals account	11,221	(Deficit 1,633)	844	190
	18,619	—	8,299	7,605
Mileage of track	17¼	17¼	17¼	17¼
Car mileage	2,200,248	2,027,135	2,773,195	2,803,993
Units per car mile	1·237	1·204	1·099	1·071
Traffic receipts per car mile ...	11·95d.	10·49d.	8·42d.	7·53d.
Power cost per car mile	2·278d.	2·228d.	1·836d.	1·532d.
Traffic rev. per mile of single track ...	£6,215	£5,027	£5,299	£4,983
Expenses per car mile	8·576d.	8·259d.	6·535d.	6·025d.
Passengers carried	22,747,240	19,050,407	21,030,075	19,847,402
Fare per passenger	1·15d.	1·116d.	1·066d.	1·062d.
Ratio of expenses	69·71%	75·92%	75·71%	78·68%
Number of cars in stock	75	75	75	75

NORWICH ELECTRIC TRAMWAYS COMPANY.—At the annual meeting the report for the year ended June 30 was presented. The comparative figures for the years 1917 and 1918 were as follow :—Receipts, £43,712, £51,220; expenditure, £30,827, £34,857; net profit, £12,885, £16,362. The amounts for expenditure include debenture interest, donations, and London expenses. To the sum of £16,362 must be added £33 brought forward from last year, making a total of £16,396 to be dealt with. It was decided that this amount should be appropriated as follows :—£1,000 to writing down cost of turbo-generator; £1,000 to writing down cost of 1914 Acts; £7,000 to reserve fund account; £2,000 provision for reconstruction and deferred repairs; £5,280 to the payment of 2 per cent. dividend on the shares of the company (subject to income tax) for the year ended June 30; and £8,116 for carrying forward. Statistics were supported as to the working during the years ended June 1917, and, June, 1918 respectively, as follow :—Car miles run, 903,434, 871,449; passengers carried, 10,767,626, 12,095,298; earnings per car mile, 11·61d., 14·11d.; expenses per car mile, 7·49d., 8·86d.; earnings per passenger, 0·97d., 1·02d.

BLACKPOOL CORPORATION TRAMWAYS.—The annual report of the general manager, Mr. Charles Furness, who is also the borough electrical engineer, for the year ended March 31, 1918, shows that the total income amounted to £119,339 and the working expenses to £68,456, leaving a gross profit of £50,883. After allocations for interest and sinking fund charges, reserve fund, etc., as stated in the table below, there was a surplus of £15,000 for the relief of the rates. This sum is equivalent, approximately, to 10 per cent. on the capital outlay. During the past year the total receipts increased by 24 per cent., and the working expenses by 24·3 per cent., while the increase in the net surplus was 43·7 per cent. The financial results for the year constituted a record in every way, and reference to the statistics given below will show that very remarkable progress has been made, which is partly due to the fact that an additional length of route has been operated during a part of the year. The lease of the Blackpool, St. Annes and Lytham Tramways Company, Limited, over the line from Squires Gate to Station Road expired on July 26, 1917, and since that time a through service has been run to North Shore. No further rolling stock could be obtained and consequently the traffic had to be provided for at the expense of other routes. Had it been possible to augment the service, a considerable amount of additional traffic could have been dealt with. Notwithstanding the increase in operating costs, the percentage of working expenses to total income was 57·36 per cent., or less than 1 per cent. more than in the previous year. In the appended table a comparison is given for the past four years :—

Year ended March 31.	1918.	1917.	1916.	1915.
	£	£	£	£
Income—				
Traffic revenue	112,777	92,077	78,824	75,344
Sundry receipts...	6,562	4,147	1,242	761
Total revenue	119,339	96,224	80,066	76,105
Expenditure—				
Traffic expenses	22,209	16,728	14,243	15,502
General expenses	12,399	10,647	7,657	7,432
Repairs and maintenance ...	12,261	10,499	8,191	9,238
Power expenses...	14,852	11,849	10,665	10,225
War allowances...	2,446	2,231	1,559	323
Through running	4,289	3,131	2,715	2,130
Total working expenses ...	68,456	55,085	45,030	44,850
Gross profit	50,883	41,139	35,036	31,255
Interest	12,640	12,056	10,901	9,878
Sinking fund	7,936	7,900	7,860	7,641
Reserve fund	3,307	2,183	3,275	1,736
Renewal fund	12,000	9,000	8,000	—
Relief of Rates	15,000	10,000	5,000	12,000
Mileage of track	21·70	21·70	21·70	21·70
Car mileage	1,252,878	1,131,728	1,069,524	1,085,656
Passengers carried	22,251,567	17,810,538	14,585,851	13,624,514
Units per car-mile	1·64	1·60	1·55	1·43
Ratio of expenses	57·36	56·40	56·24	58·93
Traffic receipts per car-mile	21·60d.	19·53d.	17·69d.	16·65d.
Traffic revenue per mile of single track	£5,696	£5,417	£4,504	£4,370
Total revenue per car-mile	22·86d.	20·01d.	17·96d.	16·82d.
Expenses per car-mile (excluding power cost)	10·27d.	8·78d.	7·71d.	7·65d.
Expenses per car-mile (including power cost)	13·11d.	11·29d.	10·10d.	9·91d.
Fare per passenger	1·21d.	1·24d.	1·30d.	1·32d.
Number of cars in stock	84	84	84	84

Repairs to the permanent way have suffered on account of the shortage of labour, and a good deal of renewal work will have to be done as soon as circumstances permit. The reserve fund for the purpose now amounts to £41,934. The maintenance of rolling stock has been particularly difficult, owing to the restrictions on materials. Only small supplies were obtained, after much pressure for priority certificates. In many instances the price for components and supplies show a rise of 250 per cent. over pre-war cost. Increasing traffic demands involve overloading, and additional cars are urgently required to relieve the present congestion before a thorough overhaul of the rolling stock can be effected. At the date of the report over 100 employees were on war service, while ten had received their discharge from military duties and had re-entered the department. Mr. Furness records his appreciation of the able manner in which the department has been served by the staff during the year. The pressure has severely taxed their energies and made many demands upon their time and abilities. Many important developments affecting the administration and policy of the department are anticipated in the near future.

Digitized by Google

CONTRACTS AND ORDERS.

Plymouth Corporation have accepted tenders for switch parts from Johnson and Phillips, Limited; and for switch gear from Siemens Brothers, Limited.

Bradford Electricity Committee has accepted the tender of the British Westinghouse Electric and Manufacturing Company, Limited, for two 1,500-K.W. rotary converters.

Derby Corporation have accepted tenders from Babcock and Wilcox, Limited, for boiler economiser, stokers, etc., for £4,747; and from British Thomson-Houston Company, Limited, for £948.

Salford Town Council have accepted a tender from E. Bennis and Company, Limited, for supplying and fitting to six boilers at the electricity station six Bennis patent machine stokers and accessories at £195 each.

Manchester Corporation have concluded a contract with Callender's Cable and Construction Company, Limited, for £394, for the supply and fixing at the electricity station of certain requisites for the bulk supply of electricity.

London County Council has arranged with Babcock and Wilcox, Limited, for the supply, delivery, and maintenance at £1,296 (after deduction of £136 for 15-in. diameter pipes, to be supplied by the Council), of the material required for alterations to coal shoots for eight boilers in connection with the burning of coke at the power station, and for dismantling existing material and erecting new material on a time basis of net flat cost plus 25 per cent.

Dick, Kerr and Company, Limited, have recently received an order for two 5,000 KW. turbo-alternator sets and condensing plants for the Union Miniere du Haut Katanga, which is one of the largest copper producers in the world, outside the U.S.A., having extensive mining properties in the Belgian Congo. The turbines will be of the Willans-Zoelly type, operating on steam at 145 lb. per sq. in. pressure and exhausting into a vacuum of 28 in. (Bar 30 in.), and will carry an overload of 6,250 KW. for two hours. The condensing plants are each designed to deal with 66,000 lb. of exhaust steam per hour and have 10,000 sq. ft. of cooling surface. The turbines will be coupled to Siemens' alternators designed for a normal output of 5,000 KW. at 9-power factor (5,560 K.V.A.) when supplying 3-phase current at 50 cycles and 6,600 volts pressure, and will be capable of carrying overloads of 25 per cent. for two hours or 50 per cent. momentarily. The ventilating air for these machines will be filtered in dry air filters of the Premier Cooler Company's make. The machines will each be fitted with a direct-coupled 110 volt exciter of the overhung type, and will operate in conjunction with an automatic voltage regulator.

PERSONAL.

Mr. C. Tomlinson has been added to the directorate of the Norwich Electric Tramways Company.

Mr. W. B. Smith, of Greenock, has been appointed manager of the Paisley Corporation electricity department.

Mr. W. Y. Anderson has been appointed commercial engineer of the City of Birmingham electric supply department.

Pte. S. J. Bird, Machine Gun Corps, a former York Corporation tramway driver, has been awarded the Military Medal.

Mr. J. S. Killick, county surveyor of Hertfordshire, has been recommended for an increase of salary to £1,300 per annum.

Mr. F. W. Ketley has severed his connection with the Norwich Electric Tramway Company. He has held the post of manager for ten years.

Mr. T. R. Whitehead, general manager and engineer of the Coventry Corporation Tramways, has been granted an increase of salary from £700 to £800 per annum.

Mr. W. H. Ellis, manager of Chester Corporation Tramways, has been granted an increase of £50 per annum in salary from October 25, with a further increase of £50 on October 25, 1919, in addition to war bonus.

Mr. H. Ingham, assistant engineer to the Mexborough and Swinton Tramways Company, has received a presentation from the staff and employees on leaving to take up an appointment with the Rotherham Corporation.

Alderman J. R. Wilson, who was recently invited to become Lord Mayor of Manchester, but declined, has been entertained at dinner by the Manchester Tramways Committee. He is chairman of the Traffic Congestion and Improvements Committee, and is also a director of the Manchester Ship Canal.

Mr. H. Cassell, a discharged soldier, now employed as a driver on the Sheffield Corporation Tramways, has been awarded the Royal Humane Society's certificate. On August 20 he dived into the canal at Rotherham and rescued a boy, restoring him to consciousness by means of artificial respiration.

Sergt. Defer, a conductor attached to the New Cross depot of the London County Council Tramways, has received the D.C.M. The distinction was presented to him by the Mayor of Deptford at a concert, organised by the London County Council Tramways (Employees) Old Comrades' Association.

Pte. B. Mercer, East Yorkshire Regiment, has been awarded the Military Medal. It was presented to him by the Lord Mayor of Hull. Private Mercer was formerly a Hull Corporation tramway driver, and enlisted in 1915, notwithstanding that two sons had joined, and that he was over military age. One of his sons has received a commission.

Mr. B. H. Bond has been confirmed in his appointment as general manager of the Dover Corporation Tramways. The chairman of the tramways committee (Councillor Barwick) said that Mr. Bond's services had been found very satisfactory. The committee accordingly made Mr. Bond's appointment permanent, at a salary of £300 per annum.

Lance-Corporal Ernest Lapidge, West Yorkshire Regiment, has saved a comrade's life by volunteering for a blood transfusion operation, in which a pint of blood was taken out of his right arm. He was formerly a tramway driver employed by the Sheffield Corporation. He has been in hospital for six months, and it was whilst a patient there that he volunteered for this operation.

Mr. A. A. Blackburn, chief engineer and assistant to the general manager of the Belfast City Tramways, has been appointed engineer and general manager of the Huddersfield Corporation Tramways, in succession to Mr. R. H. Wilkinson, who recently accepted the position of general manager of Bradford City Tramways. Mr. Blackburn, who went to Belfast 14 years ago, at the time when the system was being electrified, was previously in the service of the Manchester Corporation Tramways. The salary attached to the appointment is £600 per annum.

Mr. R. H. Wilkinson, late tramways manager for Huddersfield, who has been appointed manager of the Bradford Corporation Tramways, has been presented with a smoking cabinet from the staff and employees at Huddersfield. Mr. Partington (works superintendent) said that the presentation was to express in a tangible form appreciation of Mr. Wilkinson. Mr. Harry Dyson (chief cashier) made the presentation which was accompanied with an umbrella for Mrs. Wilkinson. Mr. Lincoln (foreman coach painter) and Mr. W. Wood (president of the men's union) expressed good wishes to Mr. Wilkinson.

Mr. C. J. Spencer, late tramways manager for Bradford, received a farewell presentation from the employees of the Corporation tramways department, at a gathering at the depot, presided over by Mr. J. W. Dawson (assistant electrical engineer). The gifts, which included a clock, bronzes, and an illuminated address, were handed to the recipient by Mr. T. Stirk (traffic superintendent). Speeches expressing high appreciation for Mr. Spencer were made by Alderman E. Priestley (chairman of the tramways committee), Councillor I. F. Akeroyd (deputy-chairman), Mr. H. Kershaw (Tramway and Vehicle Workers' Association), and Mr. W. Wood (engineering shop steward).

Mr. William Clough has resigned his position as general manager and engineer of the Bury Corporation Tramways, to take effect at the end of December, in order to accept an important position with a large firm of paper makers, with mills in the neighbourhood of Bury. Mr. Clough entered the service of the Bury Corporation in December, 1892, and was employed in the borough engineer's office for over ten years. He was then appointed general manager of the tramways. At that time the Corporation took over the steam tramways, and these were subsequently converted to electric traction. He was the responsible official at the installation of electric traction, and has since seen the system attain its present successful position. In June, 1915, as organising officer, Mr. Clough was responsible for the equipment of a portion of the tramway depot as a national shell factory, and he carried out the arrangements for the first co-operative contracts for the production of shells approved by the Ministry of Munitions. His munition scheme was very successful, the shells having been produced at a very low comparative cost. In recognition of his work Mr. Clough was recently invested by the King with the medal of a Member of the Order of the British Empire. In April, 1917, at the request of the Admiralty, Mr. Clough was lent by the Corporation to assist in the work of the Shipyard Labour Department, and his services received the warm commendation of the Lords Commissioners of the Admiralty. In May of the present year the Board of Trade requested the Corporation to allow Mr. Clough's services to be transferred to the Tramways (Board of Trade) Committee, and he was placed in charge of the Priority Section, which has dealt with the rationing of materials for tramways. At the end of September Mr. Clough was appointed honorary secretary of the Municipal Tramways Association, in succession to Mr. C. J. Spencer. A large circle of friends will regret Mr. Clough's intention to sever his connection with the tramway industry, but will wish him the greatest success in his new work.

We regret to have to announce the death, in his forty-second year, after a short illness, of **Mr. H. Cecil Walker,** the eldest son of

Digitized by Google

Mr. Henry C. Walker, chairman of Waygood-Otis, Limited, Falmouth Road, London, S.E. Mr. Walker entered the shops of R. Waygood and Company in September, 1893, and in time occupied the position of chief electrical engineer to the company. In November, 1910, he was appointed to a seat on the board of directors, and this he retained after the amalgamation with the Otis Elevator Company, Limited. He rendered great service in the design of the electric lifts which have gained for the company such a high reputation.

TRAMWAY AND LIGHT RAILWAY NOTES.

BIRMINGHAM.

SUBURBAN EXTENSION DESIRED—NO CHRISTMAS DAY CARS.

The Birmingham Tramways Committee, having been asked to extend the tramways from Selly Oak to Northfield and beyond, have replied that they recognise the importance of a tramway being laid to the districts mentioned at the earliest possible moment, but that there is difficulty in obtaining the necessary materials. The matter is, however, to be considered.—At a meeting of the Birmingham Tramways Committee, it has been decided not to run the tramway service on Christmas Day. The committee considered that that day, this year, was of special social interest, and that the tramway employees needed rest from duty.

BURNLEY.

COLLISION IN FOG.

Two tramway cars collided at Burnley about six o'clock on a foggy morning, with the result that several passengers were injured, though not seriously. It appears that it is usual for the outward bound car to wait at a certain loop until the other car has passed, but for some unexplained reason this practice does not seem to have been followed on the occasion of the collision. One car left the loop and proceeded along the single line for 30 or 40 yards, when the other car approached. The cars not being visible, owing to the fog, until they were almost in contact, it was impossible to pull up, and there was a head-on collision. The frost on the wires would, it is surmised, have the effect of diminishing the headlights on the cars. Neither car was going at a very high speed at the time, but the passengers inside and on the upper decks were pitched violently from their seats, and great confusion prevailed. The people who were on the upper deck of the outward bound car seem to have felt the collision most, and several of them sustained injuries from the broken glass and from contact with the seats and sides of the car. Both drivers had remarkable escapes, though they suffered from shock. The cars kept the rails, but were badly damaged. The fronts were stoved in, the glass screens shattered, and the windows were smashed.

DUBLIN.

INCREASED FARES.

Further increases in tramway fares have recently come into operation in Dublin. Six months ago they were advanced by about 50 per cent., following the award of better wages to the employees of the Dublin United Tramways Company. A concession to the workers has also preceded the present step, which generally adds about another 20 per cent. to the fares. The statutory fare of one penny within certain areas of the city is untouched, but, outside of these, numerous changes have been made by setting up intermediate stages, for which threehalfpenny fares have been instituted, and by the raising of some threehalfpenny fares to twopence. In certain cases the increase represents over 100 per cent. on pre-war fares.

DUNDEE.

CORPORATION AND COMPANY CO-OPERATION.

As a result of the arrangement under which the Dundee Corporation is to supply the company with electricity, thus enabling the closing of one power station and consequent economy in fuel, the reduction of service on the Dundee, Broughty Ferry and District tramways system has been cancelled and a full service restored.

FALKIRK.

ACTION AGAINST TRAMWAY COMPANY.

Judgment has been given in an action in Falkirk Sheriff Court involving the question of whether a tramway company was responsible for injuries sustained by a passenger as the result of the disorderly behaviour of another passenger. The pursuer sued the company and another defender jointly and severally for £50. Pursuer averred that while she was a passenger in an overcrowded motor omnibus running between Falkirk and Grangemouth, defender, who was also a passenger, struck another passenger with a bottle, fragments of which struck pursuer, who had to have her wounds dressed. The tramway company denied fault, and the Sheriff sustained this contention, and dismissed the action as against the tramway company, with expenses. The defender, he said, had now disappeared, and any further proceedings against him were in the hands of the pursuer.

GLASGOW.

PARCELS CARRYING.

An experiment in the carrying of parcels is to be made on one of the routes of the Glasgow Corporation Tramways.

LEEDS.

PUBLIC SHOULD LOOK OUT.

An action was brought in the Leeds County Court recently against the Leeds Corporation for damages for personal injuries received at the tramway barriers in Briggate. A passenger, who did not understand the queue system, had attempted to board a car in the usual way by the rear platform, and had been told to enter the barrier and board the car by the front platform. In making her way back she was struck a heavy blow by an approaching car. The judge found for the defendants with costs, remarking that the arrangement of barriers in a most important and crowded street was reasonable, and that in busy centres there was a reasonable obligation on the part of the public to look out, especially in or near tramway lines.

MANCHESTER.

CORPORATION TRAMWAYS POSTERS.

In a booklet dealing with the posters in a "war collection" at the Clark University Library, Worcester, Mass., U.S.A., the posters issued in connection with the Manchester Corporation Tramways are specially commended as follows:—"They are very attractive, all text, issued to stimulate contributions, for which purpose boxes were placed on the platforms of all the street cars. These Manchester tramway posters, although devoid of illustration, are a delight to the eye. They would serve as excellent models in any printing establishment on account of the beauty of their composition, type, and colour." It is mentioned that the total sum collected in these car boxes in Manchester was about £30,000 for nearly seventy different war charities.

SOUTH SHIELDS.

The motor omnibuses run by the South Shields Tramways Committee are found exceedingly useful as feeders to the tramway system, and as they practically provide an extension of the tramway service they are a great public convenience.

YORK.

SEQUEL TO INCREASED FARES—SUNDAY RUNNING.

A report presented to the York Tramways Committee by Mr. J. W. Hame (tramways manager), in regard to a proposal to increase the fares on the tramways, contains some interesting details as to the sequel to increases in other districts in Yorkshire. The tramways where the penny fare has been discontinued, and the 1½d. fare is the lowest, are at Wakefield, Bradford, Huddersfield, Mexborough, Swinton, and Scarborough. At Wakefield the falling off in passengers has been only 2·28 per cent., whilst the increase in the receipts has amounted to 20·67 per cent. At Huddersfield the falling off in passengers in the week immediately following the advance in fares was 13·2 per cent., but this figure is understood to be rapidly

CITY OF SHEFFIELD.

TRAMWAYS AND MOTORS DEPARTMENT.

Tenders for 50 Tramcars.

The Tramways and Motors Committee is prepared to receive tenders for the supply and delivery of 50 double-deck top-covered vistibule tramcar bodies with trucks.

Form of tender, general conditions of contract, and specification will be forwarded on application to the undersigned.

Each tender must be submitted on the official form supplied by the Corporation, enclosed in a sealed envelope endorsed "Tender for Tramcars," and delivered to the undersigned on or before January 7, 1919.

Any person or firm sending in a tender will be required to comply with the City Council's form of clauses respecting wages, hours, and conditions of labour, and prohibition against assigning or underletting as set forth in the "Conditions of Contract" above referred to.

The committee does not bind itself to accept the lowest or any tender.

Dated this 6th day of December, 1918.

A. R. FEARNLEY,
General Manager.

Division Street, Sheffield.

TROLLEY HEAD SLINGS

Trolley Head Slings 18" long by 3/16" diameter. Best Flexible Steel Wire Rope Galvanised, Loop-spliced in each end to take ½" bolt, and served with Galvanised Wire. Price 12/- per dozen nett (in Gross Lots). Sample on Application.

C. OSBORNE, 97 South Street, Longsight, MANCHESTER

Digitized by Google

diminishing. At Bradford the receipts per car mile have risen from 16·87d. during the week immediately preceding the advance in the fares to 21·85d. per car mile at the present time. York City Council Tramways Committee report that they have reconsidered the question of the Sunday running of cars, with the view of the cars running on the Sunday mornings to enable people to proceed to places of worship. Inasmuch as the committee have not yet effected a reduction of 15 per cent. in running mileage, as required by the Board of Trade, they are not able to entertain the suggestion.

PATENT LIST.

Abstracted for "The Tramway and Railway World" from the Official Journal of Patents.

***** If the inventions have been communicated the names of the communicators are given in italics.**

Applications for Letters Patent.

The number of the patent is given in brackets.

Automobiles using producer gas as fuel for internal combustion engine (17,646)—E. Goldsmid-Abrahams and J. W. Parker.
Construction of generators for production of gas from solid fuel for automobile internal combustion engines, etc. (17,647)—E. Goldsmid-Abrahams and J. W. Parker.
Spring shackle bolts, etc., for motor vehicles (17,643)—W. J. Bithell and A. J. Cremer.
Variable speed device (17,723)—S. Bobrovsky.
Fluid pressure braking apparatus (17,598)—J. W. Cross.
Rail joints (17,957)—L. Denonvilliers.
Vehicle brakes (17,558)—H. Fairbrother (*Morton Brake Company*).
Axle drive equipment for motor vehicles (17,719)—R. E. Fielder.
Variable speed gear (17,522)—T. J. Heskett.
Trolley wheels for tramway cars, etc. (17,858)—W. J. Hunter.
Springing motor vehicles, etc. (17,712)—A. W. Smyth.
Hubs for motor vehicles (17,618)—R. J. Treen.

STEAM AND HYDRAULIC
ENGINE PACKING
MANUFACTURERS
(Flax, Asbestos and Cotton)
And all Engine Room Stores
ATTWATER & SONS
Hopwood Street Mills, PRESTON
Telegraphic Address: "Attwaters, Preston."

STEAM CONDENSING PLANT.
VACUUM PUMPS AND EVAPORATORS.
MIRRLEES WATSON
THE MIRRLEES WATSON CO. LTD., GLASGOW

FOR SAFETY'S SAKE
See that every inch of glass in your car is
'TRIPLEX' UNSPLINTERABLE SAFETY GLASS
Nothing can scatter it, nor make splinters fly.
1 ALBEMARLE ST. LONDON W.1
Write for Catalogue No. 43c.

Switch control for automobile electric tail lights (17,575)—D. G. Zalocostas.
Railway sleepers (18,166)—C. H. Adkins.
Mounting recording instruments and engine-control devices on motor vehicles (18,014)—Arrol-Johnston, Limited, and G. W. A. Brown.
Springing or anti-vibratory device for road vehicles (18,217)—E. D. Burley and H. B. R. Clarke.
Variable speed gear (18,175)—Crossley Motors, Limited, T. N. Harrop, and T. D. Wishart.
Speed change gearing (18,334)—J. M. Gloppe.
Tramway point and switch operating devices (17,986)—G. Hendriks.
Collection of electric current by electrically propelled vehicles from overhead conductors (18,353)—E. M. Munro.
Electrical signalling for motor vehicles (18,088)—Naillik Motor Signal Company and J. P. Ogden.
Brake shoes (18,181)—D. G. Pennington and F. P. Wilson.
Insulated rail joints (18,243)—R. S. Proud.
Continuous automatic fluid-pressure brakes for railway vehicles (18,257)—J. C. Taite (*A. M. Bell*).
Fluid-pressure braking apparatus (18,244)—W. V. Turner.
Shackles for motor vehicles (18,605)—M. L. Glover and Company and H. W. Allingham.
Trolley heads for electrically-propelled vehicles (18,424)—J. P. Baker and C. W. Mallins.
Electrically-operated signalling devices (18,745)—C. B. Harlow.
Radiator for motor cars (18,633)—W. C. Hill.
Contact shoes for train controlling systems (18,543)—W. J. Mellersh-Jackson (*E. P. Waterhouse*).
Railway sleepers and chairs (18,548)—S. P. Keates.
Trolley pole controller (18,797)—W. R. Strettle.
Mechanically-controlled feed system for petrol engines (18,687)—R. J. C. Tampier.
Variable speed gear (19,274)—H. P. H. Anderson and J. McCallum.
Friction change speed gearing (19,329)—G. M. Barbier.
Electrically-propelled vehicles (19,247)—F. V. Bornand and J. P. Kemp.
Motor vehicles (18,855)—G. E. Bradshaw and A.B.C. Motors, Limited.
Speed indicators (19,158)—A. E. Brewerton.
Air-brake systems (19,052)—British Thomson-Houston Company, Limited (*General Electric Company*).
Suspension devices for automobile vehicles (19,072)—M. A. Delque and C. M. Motte.
Variable speed gear (19,061)—E. L. Firth.
Speed gears (19,103)—Horstmann Cars, Limited, and S. A. Horstmann.
Fluid-pressure braking apparatus (19,142)—A. W. Rendell.
Bed plate for friction driving gear for motor vehicles (19,029)—F. Sirett.
Apparatus for operating tramway points from vehicles (19,046)—C. E. Whyatt.
Emergency axle for self-propelled vehicles (19,002)—E. O. Wiggins.

Specifications Published.

1917.

Junction box coupling for electric conduits (12,284—*119,491*)—J. N. Scism.
Brakes (13,960—*119,499*)—S. L. C. Coleman.
Differential gearing for steering motor vehicles (15,303—*119,563* and 17,592—*119,945*)—G. M. Blackstone, F. Carter, E. Carter, and R. E. Watts.
Recording instruments for vehicles (18,528—*119,583*)—W. E. Kemp.
Means for securing wheels on motor vehicles (15,341—*119,719*)—F. L. Rapson.
Apparatus for operating railway switch points (15,907—*119,731*)—J. P. O'Donnell.
Chair keys for railways (13,506—*119,884*)—S. G. Hobbs.
Means for operating tramway points (14,779—*119,890*)—G. Hendriks.
Electro-magnetic friction brakes for the driving and change speed gear of motor vehicles (14,908—*119,897*)—G. Pollard and Menco-Elma Syndicate.
Radiators for motor vehicles (17,851—*119,948*)—J. C. B. Craddock.
Springs used in connection with the spring suspension of motor road vehicles (15,647—*120,093*)—T. A. Tisdell.
Railway points or switches (15,760—*120,099*)—B. B. Betts.
Controlling mechanism for mechanically-propelled rail vehicles (17,519—*120,130*)—Daimler Company, H. J. Balcombe, and T. Dawson.
Automobile fenders (17,907—*120,131*)—E. G. Budd and J. Ledwinka.

1918.

Differential gear for motor vehicles (4,313—*110,811*)—A. Franks.
Driving gear for motor vehicles (5,274—*119,820*)—A. T. Nogrady.
Arrangement for securing electric contact in overhead trollies for tramway cars and other electrically-driven vehicles (79—*119,958*)—A. C. Franklin.
Trolley heads for electric traction (11,779—*120,187*)—W. Pickersgill, J. H. Pitt, and F. Haigh.

Digitized by Google

TRAFFIC RETURNS.

Tramway and Omnibus Undertakings in the United Kingdom.

NAME OF COMPANY OR CORPORATION.	1917. WEEKS ENDED.					1918. WEEKS ENDED.					AGGREGATE.		
	Nov. 3.	Nov. 10.	Nov. 17.	Nov. 24.		Nov. 2.	Nov. 9.	Nov. 16.	Nov. 23.		Wks.	1918.	Increase or Decrease.
	£	£	£	£	£	£	£	£	£	£		£	£
Aberdare U.D. Council	423	453	480	443	...	474	497	457	533	...	33	16.656	—
Aberdeen Corporation	1,999	2.205	2.011	2.012	...	2.280	2.431	2.504	2.527	...	34	65.698	+ 11.372
Ayr Corporation	323	341	328	335	...	392	377	446	372	...	27	18.471	+ 3.967
Belfast City	...	...	...	...	...	...	...	...	...	...	—	—	—
Birkenhead Corporation	1.818	1.815	1.861	1.832	...	2.157	2.133	1.909	2.008	...	34	74.972	+ 12.039
Blackburn Corporation	1.325	1.366	1.395	1.328	...	1.679	1.616	1.923	1.492	...	34½	63.345	+ 11.615
Bradford Corporation	7.095	8.097	7.478	7.513	...	10.006	8.739	8.792	8.419	...	34	316.314	+ 52.056
Burnley Corporation...	1.789	1.819	1.856	1.821	...	2.145	2.147	2.153	2.064	...	—	—	—
Burton-on-Trent Corporation ...	317	329	308	325	...	375	374	404	356	...	34	14.005	+ 3.382
Bury Corporation	1.540	1.549	1.560	1.507	...	1.934	1.866	1.917	1.729	...	34	70.465	+ 13.184
Chatham and District	1.115	1.184	1.147	1.260	...	1.142	1.017	971	1.032	...	47	59.929	— 196
Cork Electric	542	556	545	572	...	548	518	503	480	...	47	28.695	+ 2.777
Derby Corporation	1.208	1.236	1.259	1.258	...	1.450	1.399	1.474	1.331	...	34	51.406	+ 9.813
Dundee City	1.463	1.505	1.531	1.536	...	1.799	1.814	1.697	1.759	...	27	52.408	+ 10.223
East Ham Corporation	1.231	1.303	1.286	1.306	...	1.386	1.494	1.676	1.527	...	33½	52.884	+ 5.184
Glasgow Corporation	26.459	26.916	26.898	26.788	...	29.068	28.658	27.720	26.492	...	25½	722.179	+ 55.523
Glossop (Urban Elec. Supply Co.)...	164	175	164	172	...	166	167	162	163	...	47	8.434	+ 1.163
Halifax Corporation	2.209	2.235	2.247	2.312	...	2.883	2.762	2.653	2.588	...	33½	95.865	+ 11.419
Halifax Corp. Motor Omnibuses ...	49	49	51	51	...	67	69	63	62	...	33½	2.247	+ 600
Huddersfield Corporation	3.033	3.143	3.201	3.215	...	3.579	3.486	3.563	3.367	...	34	123.671	+ 15.492
Ilford U.D. Council	...	...	...	...	...	...	...	...	...	...	—	—	—
Ipswich Corporation	621	574	568	578	...	622	546	665	506	...	34	26.364	+ 2.704
Isle of Thanet	151	160	148	113	...	290	259	352	264	...	7½	2.389	+ 1.056
Kilmarnock Corporation	199	213	205	205	...	268	258	302	250	...	27½	7.107	+ 1.605
Lanarkshire	2.774	2.848	2.878	2.896	...	3.780	3.603	3.926	2.783	...	47	167.032	+ 36.723
Lancashire United	...	...	...	...	...	...	...	...	...	...	—	—	—
Leeds City	10.739	10.922	11.032	11.006	...	13.222	12.660	13.850	12.636	...	34	457.553	+ 82.343
Leicester Corporation	3.865	3.960	3.940	4.064	...	4.383	4.298	4.880	4.408	...	—	—	—
Leyton U.D. Council	1.701	1.772	1.838	1.817	...	2.286	2.210	2.594	2.273	...	34	79.741	+ 14.716
Liverpool Corporation	15.963	16.384	16.189	16.498	...	19.483	18 992	19.672	18.445	...	46½	853.821	+ 124.614
Llandudno and Colwyn Bay ...	252	237	252	235	...	265	248	284	256	...	51	22.918	+ 5.086
London County Council	52.339	54.118	55.484	55.278	...	63.237	62.480	72.645	67.099	...	33½	2.193.421	+ 329.231
Maidstone Corporation	217	222	221	218	...	248	232	274	219	...	33½	9.679	+ 1.269
Manchester Corporation	20.762	21.096	21.008	21.493	...	27.137	26.148	25.929	24.631	...	34	885.427	+ 179.968
Newcastle-on-Tyne Corporation ...	8.089	...	...	8.050	...	9.210	...	...	8.070	...	34	308.996	+ 42.499
New St. Helens and District ...	...	...	...	...	...	...	...	...	...	...	—	—	—
Northampton Corporation	851	844	836	865	...	778	831	929	802	...	34	29.231	+ 595
Nottingham Corporation	4.544	4.599	4.481	4.625	...	5.562	5.406	5.768	4.795	...	34	195.421	+ 44.888
Oldham Corporation	2.750	2.740	2.676	2.733	...	3.368	3.256	3.137	3.074	...	35	122.032	+ 22.278
Reading Corporation	1.120	1.097	1.051	1.044	...	1.146	1.078	1.145	1.079	...	33½	44.342	—
Rhondda Tramways	1.595	1.560	1.565	1.576	...	1.963	1.934	2.098	1.802	...	47	84.129	+ 13.622
Rotherham Corporation	1.930	1.855	1.899	1.896	...	2.324	2.224	2.183	2.125	...	34½	81.059	+ 18.474
Sheffield Corporation	12.352	12.320	12 511	12.484	...	12.626	12.630	13.232	12.459	...	34½	468.272	+ 48.696
Southampton Corporation	2.150	2.133	2.082	2 011	...	2.411	2.422	2.664	2.322	...	33½	86.497	+ 17.019
Southend-on-Sea Corporation ...	583	617	636	628	...	1.030	963	1.131	1.021	...	34	46.882	+ 14.395
South Shields Corporation... ...	918	907	921	953	...	1.181	1.077	990	987	...	34	39.588	+ 7.189
Sunderland Corporation	1.837	1.807	1.836	1.838	...	2.296	2.299	2.100	2.035	...	34	73.017	+ 10.406
Swindon Corporation	...	...	...	...	...	...	...	...	...	...	—	—	—
Torquay Tramways	677	660	646	658	...	719	693	772	661	...	47	42.749	+ 11.444
Tyneside Tramways and Tramroads	...	...	...	...	...	...	...	...	...	...	—	—	—
Wallasey Corporation	1.410	1.430	1.398	1.428	...	1.567	1.636	1.702	1.518	...	33½	64.533	+ 9.580
Walsall Corporation	...	...	...	...	...	...	...	...	...	...	—	—	—
Walthamstow U.D. Council ...	1.095	1.136	1.139	1.153	...	1.325	1.268	1.435	1.281	...	34	49.637	+ 7.196
Warrington Corporation	524	521	672	674	...	786	792	888	731	...	34	25.793	+ 7.219
West Ham Corporation	3.353	3.542	3.613	3.659	...	4.329	4.282	4.824	4.384	...	33½	152.791	+ 28.276
Wigan Corporation	2.087	2.133	2.122	2.153	...	2.493	2.504	2.391	...	...	33	78.913	+ 13.415

*** A number of undertakings have suspended the issue of traffic returns for the duration of the war.

Colonial and Foreign Tramway Traffic Returns.

NAME OF COMPANY.	1917. WEEKS ENDED.					1918. WEEKS ENDED.					AGGREGATE.		
	Nov. 3.	Nov. 10.	Nov. 17.	Nov. 24.		Nov. 2.	Nov. 9.	Nov. 16.	Nov. 23.		Wks.	1918.	Increase or Decrease.
	£	£	£	£	£	£	£	£	£	£		£	£
Anglo-Argentine	56.328	55.395	54.485	54.384	...	53.895	58.679	58.128	58.080	...	47	2.622.907	+ 184.074
Calcutta ... ... Rs.	54.590	65.374	65.503	69.672	...	70.779	72.989	76.638	82.253	...	47	30.851,210	+ 314.649
Madras ... ... Rs.	35.418	(2 weeks)	35.433	(2 weeks)	...	39.598	(2 weeks)	29.801	(2 weeks)	...	44	827.287	+ 95.639
Pernambuco	4.313	4.333	4.279	4.333	...	3.892	4.528	4.748	4.726	...	47	204.284	+ 24.036

Companies issuing Monthly Statements only.

	1917.						1918.						Wks.	AGGREGATE.	
	June.	July.	Aug.	Sept.	Oct.	Nov.	June.	July.	Aug.	Sept.	Oct.	Nov.		1918.	+ or −.
	£	£	£	£	£	£	£	£	£	£	£	£		£	£
Ballarat & Bendigo	2,811	2,563	2,766	...	...	...	3.075	2,948	2,996	...	...	...	20	16.400	+ 845
Brazilian Trac. Mlrs	7642000	7795000	8064000	7925000	...	...	9087000	9465000	9491000	9081000	...	...	39	77.730.000	+ 9.300.000
Brisbane	32,475	32,720	36,925	31,600	33,580	...	36.245	36,360	42,670	35.400	36.780	...	43	362,634	+ 34,214
British Columbia $	373,029	438,378	454.425	457.709	491.964	...	488.873	413.968	544,339	575,476	580.354	...	17	2.114.137	+ 271.661
Buenos Ayres L'c'z.	38,020	38,063	39.111	33.655	39,067	...	38.375	41.145	41.817	41.006	41.843	...	17	165.812	+ 13.915
Burma	25,463	26.288	26.714	26.167	...	...	31.158	34.848	41.855	30 836	...	...	8	72.691	+ 43.123
Cape Town	...	16.067	15.480	...	17.128	...	17.612	18.409	19.055	17.872	13.877	...	—	—	—
Carthagena & H....	5,325	5.763	4.164	4,306	2.805	3,932	5.047	5,491	2.729	2.549	2,525	2,988	48	43.914	− 1.228
Cordoba	14.416	14.343	14,233	...	...	...	...	...	15,734	...	...	...	21	79,054	+ 8.740
East India	1,186	1,183	1.562	1.512	1,229	...	1.754	1.968	1.975	1.939	2.044	...	13	5.958	+ 1.655
Kalgoorlie	2.648	...	...	...	...	...	2.747	...	...	...	...	...	26	15,985	+ 544
La Plata	3,852	3.876	4,075	3.450	3,742	...	5.134	6.722	4.382	4.999	5.334	...	47	56.826	+ 12.469
Lima	28,557	37,731	38,424	35.636	...	...	42,129	45.974	44,711	42.861	...	...	39	389,668	+ 67.475
Manaos ... Rs.	...	...	...	...	...	...	...	...	...	...	...	...	21	741.459	− 16.679
Manila ... $	...	...	...	...	...	...	...	...	...	...	...	...	21	367.500	+ 100.060
Monte Video ...	27.458	28,597	28.860	29,426	30.153	...	30.503	31.684	16.937	29,611	33.203	...	52	380,276	+ 20.444
Peruvian ... $	965,420	975,000	979.430	950,740	1047220	...	1099470	987.300	1029610	957,910	1090815	...	17	4.065,635	+ 113.245
Port Elizabeth ...	...	3.544	3.360	...	3.885	...	5.404	3.395	3,725	3.661	2.751	...	—	—	—
Rangoon	4,383	4.783	4.788	5.163	...	...	6.163	6.055	5.760	6.067	...	...	39	52.627	+ 8.272
Toronto ... $	984.529	954,192	1039819	1023517	1043886	...	1035932	1049936	1070567	1119925	1048478	...	43	10645075	+ 710.077
Winnipeg ... $	254,226	242,797	248,457	267,170	301,772	...	293,140	288,155	288,974	285,670	295,005	...	43	2.969.142	+ 235,626

Digitized by Google

Daimler

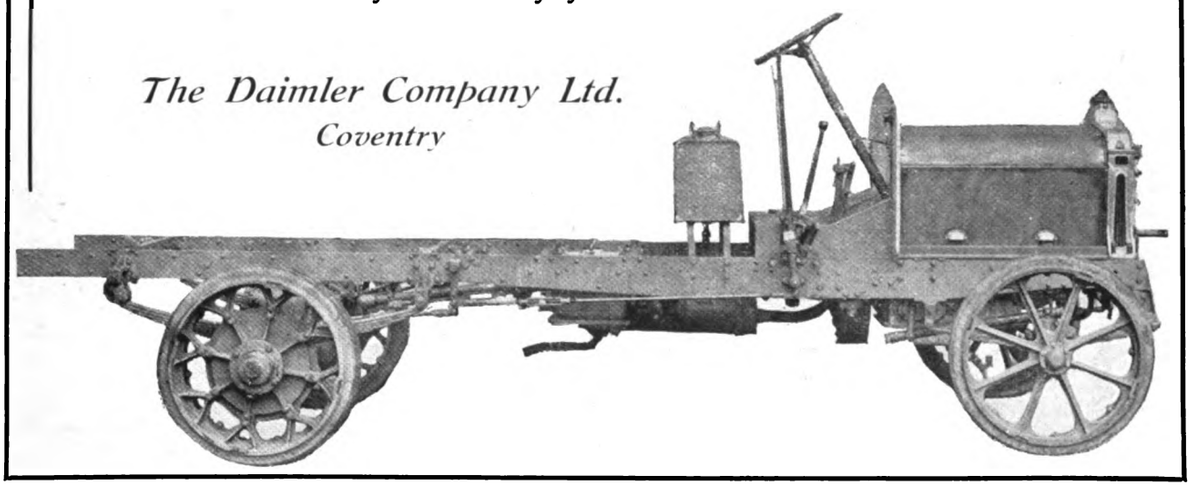
The Daimler Two-Ton Lorry

ONE thing demonstrated during the past four years is the outstanding efficiency of the Daimler Two-Ton Lorry. In all climes, under all conditions, Daimlers have maintained their reputation for reliability, power, simplicity, and economy.

ANOTHER thing demonstrated is the fact that there is no lorry TOO GOOD for a job that must be done regularly, with absolute certainty, and with despatch.

DURING the next few years there will be demonstrated in no uncertain degree the wisdom of regarding Prime Cost as only one factor, and a minor one too, in the estimation of the cost of motor lorry service. The prime cost of a Daimler Lorry covers more than a mere vehicle, it is absolute insurance of maximum efficiency over many years.

The Daimler Company Ltd.
Coventry



Digitized by Google

NAPIER

MOTOR VEHICLES.

TWO MODELS

To Carry 30/45 cwt. & 3½ tons Respectively

"The Design and Construction are Throughout of a Character, which it would be Exceedingly Difficult, if not Impossible, to Improve Upon."

RAILWAY GAZETTE. March 31, 1916.

IN PEACE

USED BY THE LARGEST CARRYING COMPANIES AND COMMERCIAL HOUSES.

IN WAR

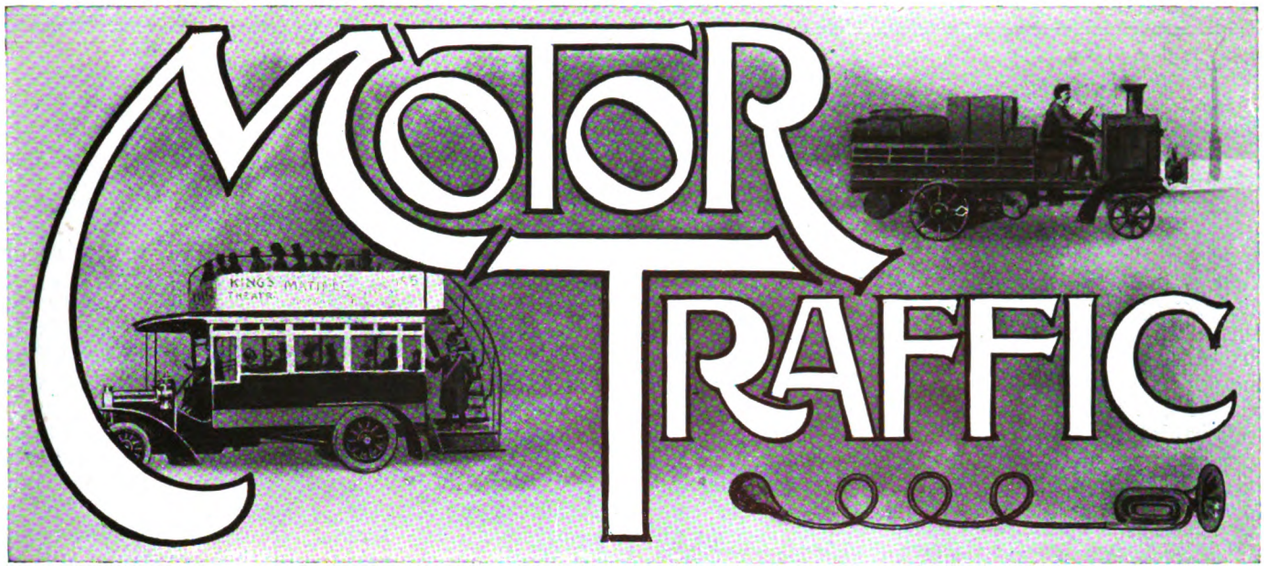
USED BY THE BRITISH AND ALLIED GOVERNMENTS.

D·NAPIER & SON LTD

WORKS
ACTON, LONDON. W

14, NEW BURLINGTON ST. LONDON. W.

Digitized by Google



POST-WAR IMPROVEMENTS.

After an interval of nearly four and a half years there now faces us the prospect of very rapid developments in the civilian use of motor vehicles and in the design of vehicles for other than military service. As regards design, and dealing particularly with the commercial and public service vehicle, it would be unreasonable to expect any very revolutionary novelties to be put forward at an early date by responsible manufacturers. The commercial motor industry has been concentrated throughout the war upon the production of two or three broad types of military lorries. The experience gained has been such as to lead to the elimination of features found to be incapable of standing continuous service under extraordinarily arduous conditions. Changes have not been embodied unless essential or comparatively easy to incorporate without complicating the spare part problem and that of maintenance. The first post-war products of commercial vehicle manufacturers available for civilian use will be the military type of chassis fitted with bodies to suit various customers. At the earliest possible moment manufacturers will also fill in the evident gaps in their present programme, and produce as many as they can of models having road-carrying capacity different from that required by the War Department. The necessity for working along the line of the least resistance points to the probability that these types will not differ very greatly in important features from their predecessors. The difference will lie rather in a general tendency towards simplification, the elimination of unnecessary weight, and a greater ability to use inferior fuels with good economy. This last is a point of great importance. The quality of fuel has been steadily depreciating, and manufacturers have had to reckon with this fact. Since they last supplied the general public, they have learned a great deal as to the means of utilising the heavier fractions of somewhat crude spirits and the avoidance of detrimental effects due to the tendency of such fuel to neutralise the qualities of lubricating oil and to cause corrosion and other troubles. During the war the embodiment of improvements has, of course, been hindered by the crying need for simplification in maintenance by means of complete standardisation. Thus even the earliest post-war models incorporating the manufacturer's experience are likely to possess marked advantages in details rather than in general design when compared with the war-time output of the same firms.

VEHICLES FOR CIVILIAN WORK.

As to the availability of new or second-hand machines for civilian work, the position is changing rapidly, so that any statement made may well be out of date before it catches the eye of the reader. At the moment of writing a number of leading firms are able to supply a moderate percentage of their output of heavy vehicles to civilian buyers. These vehicles are of military type. The remainder of the output still goes to the Ministry of Munitions, and the percentage taken by the Ministry may vary in accordance with the development of events. For some time to come the civilian demand is likely to be in excess of available supply, and those who require vehicles urgently should therefore make up their minds at once and get into touch with the manufacturers. We cannot advise waiting with a view to picking up second-hand machines at low cost. The fact that the Government is still taking large numbers of new chassis is safe proof in itself that surplus vehicles in sound condition are not likely to be thrown upon the market for some time to come. A few duds and obsolete types may find their way into the auction rooms. Even when good vehicles begin to figure among the War Department's surplus stock it is probable that all the first batches will be absorbed by other Government departments in connection with various schemes of reconstruction, such as those concerned with the improvement of roads and with big housing schemes. Many vehicles will doubtless be required for service throughout their lives in the rebuilding of devastated areas. Many others will be kept in commission in connection with armies of occupation, and will work out their term of existence in military service. Later on we anticipate that plenty of surplus machines will come steadily on to the market. By that time they will not represent the most modern types, but they will probably be sound investments for general civilian use, appealing particularly to those that cannot afford the cost of new machines.

DISPOSAL OF SURPLUS VEHICLES.

These considerations bring us to the general question of the disposal of surplus vehicles. As regards this, we anticipate rapid developments. The whole matter has been hanging fire for years in a most aggravating way. No complete settlement has yet been reached, but the trend of events is in the right direction. It now seems practically certain that all the surplus machines which the Government desires to place upon the market will pass through the hands of their own

Digitized by Google

MOTOR TRAFFIC

manufacturers for repair and overhaul, following upon which they will carry their manufacturer's guarantee of condition, and their selling value will be materially increased thereby. They will then be disposed of by their manufacturers and agents, acting on behalf of the Government. In general principle this is the scheme that we have always advocated, and we believe that it is now practically certain that it will be adopted, though the details have not yet been completely worked out and agreed. It is, however, a subject for congratulation, assuming that our information is correct, that the system of auctioning large batches will not be adopted. Such a system would have led to very widespread dissatisfaction among people seeking extraordinary bargains, and frequently getting the worst of the deal. It would also have had a most damaging effect upon the goodwill of the industry, and we are convinced that the price realised over a complete series of auctions would have been very poor.

THE UNNECESSARY SLOUGH DEPOT.

Various interesting developments of the past weeks include a re-opening of the whole question of the Slough depot. The Financial Committee has taken more evidence on this subject, chiefly, no doubt, as the result of a large number of questions asked in the House of Commons, the replies to which were by no means convincing. The Committee now expresses considerable surprise that the estimate of expenditure by the War Department has quietly risen from a million to a million and three-quarter pounds. In consequence of this, and of the radical change in circumstances since the Committee first approved the scheme with reservations, it is now urged that the whole matter should go before an independent tribunal. This is obviously necessary. The original claim that the depot was needed as an emergency war measure ceases to carry any weight, and before all this money has been irrevocably spent, and probably wasted, it is only right that the country should know what are the real purposes which the promoters of the depot have in view. Nothing on this scale is required in connection with the repair or housing of Government vehicles. There are plenty of munition works now available for such purposes, in so far as the original manufacturers themselves may not be able to fulfil all requirements. A great national manufacturing concern is certainly not needed in this industry. The system of individual enterprise has proved highly successful, and the immense difference in the demand in times of peace and in times of war would make any large factory a most uneconomical investment.

ROAD IMPROVEMENT AND TAXATION.

Up to the time of writing no definite information has been obtainable as to the Government's intentions in the matter of road reconstruction. This subject is very important to all motor users, since it will inevitably be found to be bound up with the question of motor taxation. It is clear that a clear understanding must be reached as to whether the proceeds of such taxation are to be regarded as contributions to local or to national funds. A combination of the two systems is almost inevitably unfair. Thus the local authority will argue that taxation in favour of a national fund does not pay for any damage that may be done to the local road, and therefore need not be taken into account in the local authorities' proposals for taxation. A similar argument applies the other way round. What motor owners ought really to fight for is the principle that decent roads are necessary to the entire community, and not to motorists only, and that road upkeep should therefore be a national charge, and should not be defrayed out of motor taxation. On the other hand, definite road improvement required in the interests of motor vehicles, but not otherwise necessary, has the effect of decreasing the cost of operation of vehicles, and is therefore worth paying for. We thus arrive at the principle that the whole of the profits of motor taxation should go to road improvement as distinct from road maintenance. The question is complicated by the diversity of authorities responsible for our roads. There are strong arguments in favour of the nationalisation of main roads, but it is very questionable whether these will prevail.

ROAD TRANSPORT BOARD.

HANDBOOK CONCERNING ITS CONSTITUTION AND FUNCTIONS.

The Road Transport Board (Board of Trade) have issued a "Handbook on Road Transport," containing information concerning the constitution and functions of the Board, with two maps of England, Wales, and Scotland. It is published by H.M. Stationery Office and may be obtained at 2s. per copy. The date of issue from the Board's office at Berkeley Street, W.1, is October, 1918.

At first sight the reader may be inclined to doubt the utility of such a publication now that peace is assured. It is therefore advisable to recall that the Board was not appointed by the President of the Board of Trade, with the concurrence of the War Cabinet, until February 18 last, and that although their activities were to be limited to the duration of the war, power is given for the continuance of the Board's operations with the concurrence of the Minister of Reconstruction.

As a considerable period is likely to elapse before the petrol and forage supplies become normal for civil use, no surprise will be created if the existence of the Board is extended until well into the year 1919. Apart from its usefulness as a record of the work which the Board have performed during their short existence, it is to be hoped that the volume may serve a useful purpose after the dissolution of the central authority and of the divisional board, advisory committee, and area committee, which were appointed in each of the thirteen divisions into which England, Wales, and Scotland have been formed for carrying out the functions of the Board. Information as to the constitution of the central and provincial bodies and of the work to be carried out has been given from time to time in this journal. The board's terms of reference could, in a large measure, be adapted to the time of peace in a wisely governed country, without encroaching on individual freedom. Of the foundation existing for this expression of opinion, the reader may judge from the appended quotation of the terms of reference :—

"To co-ordinate the work of existing Government departments in connection with road transport; to determine what further measures are necessary to ensure the most economic use of road transport vehicles, and their efficient allocation for meeting such requirements as may arise from time to time for the transport of food, munitions, and other war material, and for the essential needs of the trade and industry of the country; and, subject to the direction of the Board of Trade, to give executive effect thereto."

The Road Transport Board are an inter-departmental body attached to the Board of Trade, and consisting of representatives of the following departments :—Board of Trade (Petrol Control Department), Board of Trade (Horse Transport Department), Ministry of Munitions, Ministry of Food, War Office (Transport), War Office (Upkeep of Roads), Post Office, and the Road Board.

With the exception of compulsory registration of road transport vehicles, the measures of the Board have been based upon the voluntary co-operation of traders and owners and users of transport, and the nature of the schemes of co-ordination have been relegated mainly to the discretion of the Divisional Transport Boards. Whatever may be the ultimate fate of the Road Transport Board itself, it is to be hoped that the Area Transport Committees may be continued to develop the return loads movement.

Digitized by Google

MOTOR TRAFFIC

PETROL RESTRICTIONS RELAXED.

The Board of Trade announced on December 6 that during the Christmas holidays the restrictions on the use of petrol would be suspended to the extent of allowing motor vehicles to be used between December 16 and January 10 for any purpose without limitation of distance. No additional petrol will be provided. An increased allowance of spirit for cabs is promised.

After consultation with H.M. Petroleum Executive, the Board of Trade has announced that it will not be possible for some time to withdraw entirely the restrictions on the use of petrol for driving motor vehicles. H.M. Petroleum Executive are making arrangements to provide as quickly as possible increased supplies of petrol to be distributed by the Petrol Control Department for civilian purposes. The conditions resulting from the Armistice have already involved a material increase in the consumption of petrol in connection with the army in France, and the increased heavy demand in this respect will continue for some little time.

Arrangements are being made at once for the transfer of ships which have been carrying fuel oil to the purpose of carrying petrol, but on account of the necessity for cleaning the ships it will be several months before they will all be ready. In the meantime, having in view the greater facilities which will be available for increasing the petrol stocks later on, the Board of Trade will be able to some extent to relax the restrictions at an early date. It is therefore proposed that :—

(1) The Motor Spirit Consolidation and Gas Restriction Order, 1918, shall be modified so as to permit, on and after December 1, 1918, the use of motor spirit by licence holders for driving motor vehicles of any type for all purposes within a radius of thirty miles of the place of residence or business of the licence holder. So far as journeys beyond this radius are concerned, the restrictions will for the present remain in force, but will be removed entirely as soon as possible.

(2) After January 1, 1919, if the conditions of the stocks of motor spirit at that time permit, the Petrol Control Department will be prepared to consider applications from owners of commercial and public utility vehicles for an increase in their present allotments. Applications for licences will also be considered from owners of vehicles of this type who do not at present hold licences.

It is also anticipated that shortly afterwards the department will be able to consider applications for licences from private vehicle owners who do not at present hold licences, and for increased allotments in the cases of existing licences. For some time to come motor spirit will only be obtainable under licence as hitherto.

The New Order.

On November 28 the Board of Trade issued a new Order providing that nothing in paragraphs 2, 3, 4, 5, or 9 of the Motor Spirit (Consolidation) and Gas Restriction Order, 1918, shall prevent the use of petrol or petrol substitute, obtained under the provisions of a motor spirit licence, or of gas by the holder of a gas permit, for the purpose of driving any motor vehicle or motor boat within a radius of 30 miles from the place where such vehicle or boat is usually kept. The new Order has effect from December 1.

The President of the Board of Trade having considered the representations made by the Commercial Motor Users' Association, the London and Provincial Omnibus Owners' Association, and other bodies, the Petrol Controller has arranged "to consider on its merits any individual application for an increased allotment, in view of the additional quantity of foodstuffs to be delivered during December." Mr. F. G. Bristow, general secretary of the C.M.U.A., will be glad to assist traders using motor vehicles for the distribution of food, who desire to make special claims.

Expected Reduction of Prices.

The Standing Joint Committee of Mechanical Road Transport Associations, which committee has been urging on the Government the national necessity for the earliest possible reduction in the prices of petrol and paraffin, has been informed by the Director of the Petroleum Executive, Sir John Cadman, that "there is good ground to hope that unless there is an unexpected change for the worse in the position, some reduction in these prices will be possible either at the beginning of December or January next."

On December 1 a reduction of 2d. per gallon in petrol and petroleum was announced.

Retail Petrol Delivery Order.

The President of the Board of Trade has ordered the withdrawal until further notice of the instruction issued by the Road Transport Board restricting deliveries by retail traders in petrol to a radius of ten miles.

Petrol for the General Election.

Before the prorogation of Parliament, Sir A. Stanley, President of the Board of Trade, stated that for the purpose of the General Election it had been decided to make some increase in the allowance of petrol, both for candidates and their agents. The allowance will be increased by 10 gallons in each instance. That would increase the amount from 20 to 30 gallons according to the size of the constituency.

Replying to an appeal from Colonel Lowther for a larger supply to members who represented very large constituencies, Sir Albert Stanley said that the question of the allowance of petrol was very carefully considered by representatives of all departments, and the matter was under discussion for several weeks. The decision was the result of a carefully prepared plan. He had gone into the matter since, and although he did not pretend to be a proper authority to determine what could be done, he felt that the decision come to by those competent to advise the Government was the best in the circumstances. The special permits and licences which would be issued to Parliamentary candidates and their election agents would be valid during the seven days preceding the issue of the writ as well as during the period between the issue of the writ and the day following the close of the poll.

Transit of Election Machinery.

As the result of representations made by returning officers in respect to the conveyance of the voting compartments, ballot boxes, stamping instruments, etc., to the polling stations, the Road Transport Board has instructed each of its divisional road transport officers to take immediate steps to assist in the provision of transport on the receipt of a request from the acting returning officer or deputy acting returning officer. The Local Government Board, in making the foregoing announcement, has also stated that in any case in which difficulty is anticipated the returning officers should communicate with the transport officer of their particular area.

THE CIPPENHAM MOTOR DEPOT SCHEME.

Makers' Offer to Undertake Repairs of Discarded Vehicles.

Three questions relative to the War Office project for the erection of a huge depot at Cippenham, Bucks, for the repair of motor vehicles brought over from France were put to the Under Secretary of State for War before the prorogation of Parliament.

Captain Carr-Gomm asked if any experts other than the expert officers of the directorate of supplies and transport at the War Office and the Mechanical Transport Board were members of the conference which considered the offer of motor firms to undertake the repair of a large number of motors at a quarter of the cost of the Government scheme at Cippenham ; and, if so, would he say whether these were civilian experts ?

Mr. Macpherson said the answer to the first part of the question was in the negative. Several of the officers who were consulted were, however, expert engineers in civil life.

Captain Carr-Gomm asked if it was not a fact that the only people who decided upon this scheme were those interested in the promotion of it ?

Mr. Macpherson gave a negative reply.

Mr. Grant asked if, in view of the present military situation, any diminution of expenditure was contemplated in regard to the Cippenham works ?

Mr. Macpherson : The authorities are in close touch with the Select Committee on National Expenditure regarding these works in view of the military situation. Pending a decision, the expenditure is being curtailed as much as possible.

At a later sitting Mr. Grant asked the Under Secretary whether he was aware that, owing to the shortage of houses in the neighbourhood, at least 1,000 new cottages would be required for the permanent staff of workmen to be employed at the depot when in full working order ; whether the estimated expenditure of £1,750,000 on this depot included any sum for the provision of workmen's dwellings apart from the temporary huts now in use ; and, if not, by whom and when and at what cost were these dwellings to be provided ?

Mr. Macpherson said he was not aware of any shortage of houses in the neighbourhood to meet the probable requirements of the permanent staff. In any case it should be possible for the employees to reach the works by using the Great Western Railway. The estimated expenditure included the provision of housing for the military personnel that would be employed at the depot, but it was not proposed to provide any other dwellings.

A correspondent of a daily newspaper reports that motor lorries are being shipped back from France in hundreds, and that he has

Digitized by Google

MOTOR TRAFFIC

heard a story of one, with a few easily remediable defects, being purchased for the ridiculous sum of £15.

RECOMMENDATIONS BY A SELECT COMMITTEE.

The necessity for immediate action by the Government in reference to the motor depot scheme is emphasised by the fact that under the "power to break" clause of the contracts, the Ministry of Munitions have given manufacturers notice that contracts for motor vehicles are to be terminated. It is also made clear by the Select Committee on National Expenditure, in their final report issued in November, that the War Office intend to use the depot for the repair of war worn vehicles.

The Committee state that the number of motor vehicles at home and in foreign theatres of war which need attention is 52,130 lorries, 28,590 cars, and 33,880 cycles. An output of repaired vehicles of 100 lorries, 100 cars, and 200 cycles per week for three years is contemplated, and a War Office estimate shows that, after writing down the capital expenditure to about 25 per cent. of its original sum, their experts anticipate a net profit on the undertaking of £1,233,772.

No opinion is expressed by the Committee as to whether the estimate is likely to be realised, and they recommend that the estimate should be subject at once to independent expert examination. They also recommend that an immediate reply from the Ministry of Munitions as to the availability of alternative premises should be obtained, and that the Government should review the question of proceeding with the work until the reply of the Ministry of Munitions is obtained. It is further advised that the proposals with regard to housing of personnel should be re-examined.

Reporting on the depot scheme as a whole the Select Committee state that the progress of the work has been inspected and fresh evidence has been obtained. The estimated expenditure has increased from a sum slightly exceeding £1,000,000 to £1,750,000. The increase is due partly to the rise in the cost of construction and partly to the unreliability of the first rough estimates. They express surprise that an estimate should have been found incorrect by so large a percentage. In view of the early termination of the war, the Committee advise that the Ministry of Munitons should release some of their premises for the storage of vehicles and their repairs.

In an apparently inspired statement published in a daily newspaper at the end of November, the following statement was made in reference to the motor depot project at Slough :—"The scheme has been seriously retarded owing to trade opposition. All similar opposition from manufacturers must be set aside, as in time they will learn that trade developments, such as should now take place, will more than absorb their output."

MOTOR OMNIBUS MAINTENANCE.

The second meeting of the fourth series of Operating Department efficiency meetings in connection with the London Underground Railways and London General Omnibus Company Group was held recently at the London General Omnibus Company's Training School, Mr. H. E. Blain (operating manager) presiding over an attendance of over 200 members of the administrative and control staffs. An exceedingly interesting lecture on "Omnibus Maintenance" was delivered by Mr. W. I. Johnston (chief depot engineer, L.G.O.C.), who, in addition to giving an historical *resume* of motor transport from its inception, and the gradual development of the motor omnibus chassis and body, reviewed the garage personnel and methods necessary for an efficient maintenance. He described the various forms and records kept, and the system of overhaul so largely responsible for the excellent condition in normal times of the London public service omnibuses. The methods adopted to secure economy in petrol consumption and to ensure both garage and independent tests of important parts of the chassis were described, whilst an interesting series of charts illustrated the manner of keeping records in connection with lost mileage and involuntary stops due to engineering defects, the cost per mile for important items, and the running of each individual omnibus. The special depot for dealing with tires and welding, and the oil reclaiming and rag washing depot were described, as well as the company's lorry systems of distribution of parts and stores. The lecture was illustrated by a number of slides and two very excellent films, showing the activity of the omnibus engineering staff in connection with maintenance and output. The discussion was opened by Mr. H. S. F. Lansdown (assistant general superintendent), and continued by Messrs. Soutter, Symes, Smith, Beech, Rozier, Clarke, Eden, Clent, Heath, Shave, Blake, and Thomas. The next efficiency meeting will deal with a number of papers by members of different grades of the control staff on "Problems in My Official Life."

STEAM WAGONS AND FUEL ECONOMY.

It is estimated that there are in operation 12,000 steam motor road vehicles, consuming an aggregate of over 750,000 tons of fuel per annum, and that this may soon exceed 1,000,000 tons per annum. The present efficiency of these units is about 50 per cent., so that an increase to 60 per cent., thereby saving 10 per cent., or 100,000 tons of fuel, is well worth aiming at, remarks a fuel specialist in a recent issue of *Motor Traction*. If in addition this economy can be effected by the substitution of coke as a fuel in place of coal, further gains occur in the form of coal gas and the tar residuals and distillates. Normally, however, the grates are designed for the combustion of Welsh coal. Many, however, doubtless operate in localities in which difficulty may be experienced in procuring this type of fuel. Each different type of fuel necessitates differences in the construction of grates, and the arrangement of draughts for combustion. Thus, Welsh coal may contain about 15 per cent. of volatile matter, which is immediately distilled when the fuel is fired, and demands a large proportion of air for its complete or nearly complete combustion. Coke, on the other hand, contains only about 2 per cent. of volatile constituents. Again, for equal thermal value coke occupies nearly twice the bulk of the coal, and thus on the same grate the same rate of combustion would necessitate a depth of coke practically twice that of coal. For effective draught through such a coke fire increased draught pressure is necessary in addition to freer access provided by increased air spaces in the fire grate. By this means grates ordinarily designed for coal may be adapted for coke, the use of which offers advantages in its greater accessibility, in addition to those already mentioned. Recent tests are quoted showing an increase in thermal efficiency of from 50 per cent. in the case of eight different kinds of coal to 64 per cent. in the case of coke, the sample of the latter being of an inferior quality of about 10,000 B.Th.U.'s, whereas ordinarily the thermal value of coke is of the order of 12,000 B.Th.U.'s. Modification of design of fire grate to permit of the use of coke thus adds to the advantages of the steam wagon, in addition to effecting smokeless combustion.

STANDARDISATION OF RUBBER TIRES.

At the request of the British Rubber Tire Manufacturers' Association, Mr. W. H. Paull, development superintendent of the Dunlop Rubber Company, has prepared a draft scheme for the consideration of the committees who are taking steps to standardise motor tires. It is proposed to deal with a limited number of tire and rim sizes capable of meeting the requirements of present and future types of vehicles, including cars of all kinds, heavy commercial vehicles, motor cycles and pedal cycles.

As regards solid tires it is proposed to have four British standard diameters, viz., 670, 720, 771, and 850 mm. respectively, with tire sections shown in the appended table :—

MILLIMETRE SIZES.

Wheel Rim Diameters.	Tire Sections.
670 mm.	160, 180 mm.
720 mm.	90, 100, 120, 140, 160, 180 mm.
771 mm.	100, 120, 140, 160, 180 mm.
850 mm.	100, 120, 140, 160, 180 mm.

Sections larger than 180 mm. to be made to 850 mm. diameter only. Taking 881 mm. and 850 mm. diameter wheels together, the sizes shown cover nearly 80 per cent. of the present demand for solid tires.

INCH SIZES.

As adopted by the War Service Committee, U.S.A. (division solid tires), July, 1918.

Overall Tire Diameters.	Tire Sections.
32 in.	3, 3½, 4 inch.
36 in.	4, 5, 6, 7, 8, 10 inch.
40 in.	5, 6, 10, 12, 14 inch.

In the inch sizes the American standard range is adopted of 32, 36, and 40 inch overall tire diameters; the first ranges in section from 3 in. to 4 in., the 36 from 4 in. to 10 in., and the 40 from 5 in. to 14 in.

In his report Mr. Paull refers to the waste caused by the production of types of tires that are nearly the same, and states that the adoption of the scheme would not necessitate the laying down of new models. All that is proposed is that fewer types should be made with the result that stocking would be simplified, and that a user requiring a new tire would be practically certain of finding his standard tire at any depot.

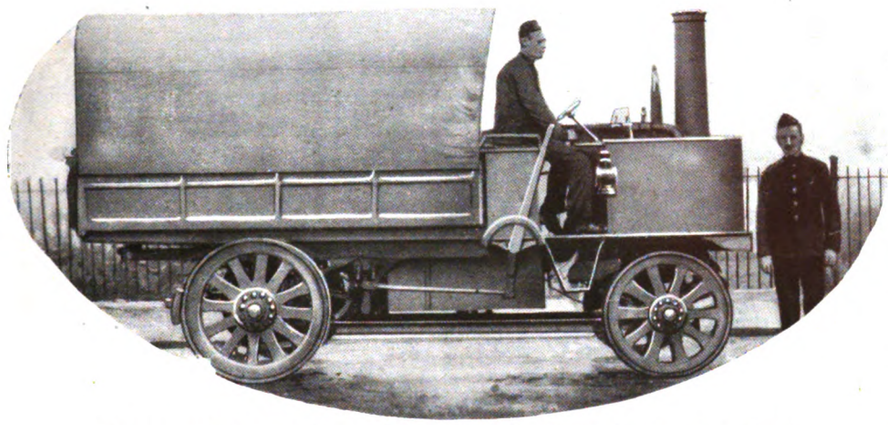
For the present it is proposed that the manufacture of non-standard tires should be continued, but as existing non-standard rims pass out of use the production of these tires will cease.

Digitized by Google

MOTOR TRAFFIC

THORNYCROFT VEHICLES IN WAR SERVICE.

In view of the important part mechanical transport has played in the great war now happily ended, John I. Thorneycroft and Company, Limited, are of the opinion that some particulars of the work done by them from the inception of mechanical transport in the army up to the present time will be of interest to all users of motor vehicles, and have therefore published a booklet giving some details of the various machines supplied for army use since 1899.



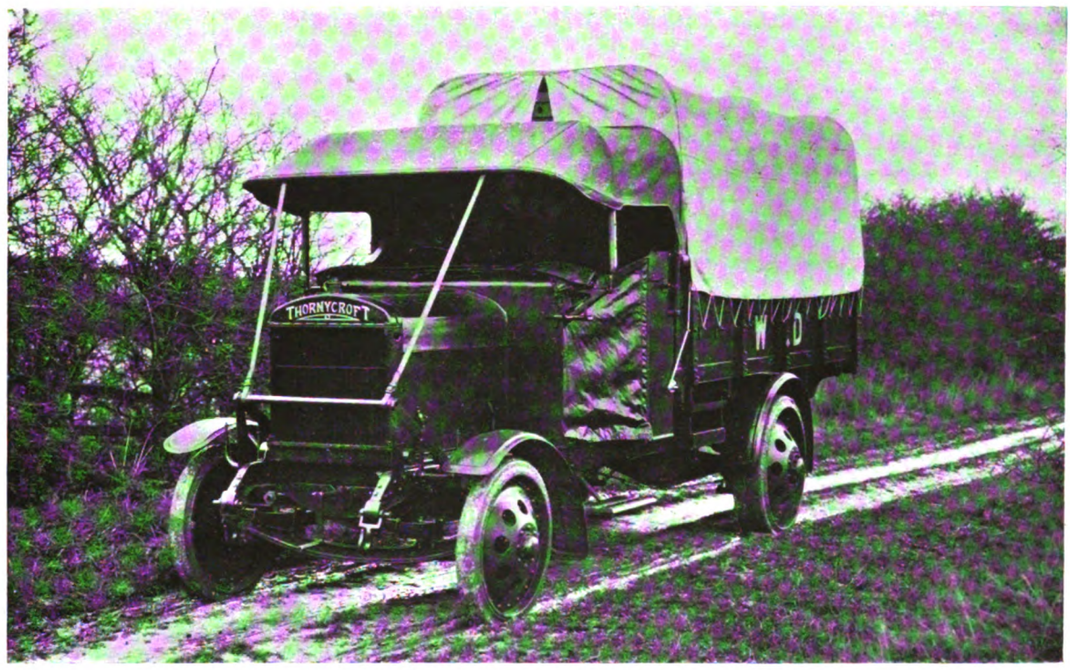
Thornycroft Steam Wagon Supplied to the Royal Engineers in 1899.

From the particulars given it would appear that for some time previous to the South African War the Royal Engineers used a few steam traction engines for special traction purposes, but it was not until the autumn manœuvres of 1899 that mechanical transport was tested with a view to its adoption as a regular unit of the service. The first machine purchased by the Royal Engineers was a steam wagon built by Messrs. Thornycroft. As a result of the experimental work done by this vehicle, an application was made by the Army Service Corps to Messrs. Thornycroft for the loan of a number of steam lorries for trial in connection with the 1899 manœuvres, all of which did extremely well. In the following year Messrs. Thornycroft were again asked to loan a number of vehicles, the results being also considered highly satisfactory, so much so that shortly afterwards ten 3-ton wagons were ordered by the Government and handed over to the Army Service Corps.

In 1901 the War Office had become so impressed with the possibilities of the steam motor wagon that they instituted a competition for the best type of motor vehicle for military purposes, offering a prize of £500 and orders for the winners for a certain number of vehicles. This competition was won by the Thornycroft lorry, which was purchased by the Mechanical Transport Committee, and orders were placed for others by the War Office and Indian Government.

Excellent illustrations are given of these early machines, together with those of the various types supplied from time to time, up to the latest petrol war model, upon which the whole resources of the firm has for many months been concentrated, and which can now be delivered to the public. Illustrations are also given of the special Indian standard lorry and mobile workshop, each being mounted upon the firm's 40 H.P. "X" type, of which over 100 have been supplied to the order of the India Office.

MOTOR EXHIBITIONS.—The Society of Motor Manufacturers and Traders has decided to organise a series of exhibitions. The annual touring car exhibition will be held at Olympia in November, 1919. This, as usual, will include a full display of tires, and accessories and components. The international aero exhibitions, begun by the society in 1909, will be resumed. The pioneer work of the society in this respect proved of great national value in 1914. There is likely to be combined with this exhibition a display of motor tractors.



A 40-h.p. Type "J" Thornycroft 3-Ton Lorry as Supplied to the War Department.

Digitized by Google

MOTOR TRAFFIC

MOTOR TRAFFIC NOTES.

MUNICIPAL MOTOR WORKS.—Gloucester City Council have arranged to convert an old smithy into a workshop where repairs to motors can be carried out for the fire brigade.

SHEFFIELD'S SUSPENDED SERVICES.—At a meeting of the Sheffield Corporation it was stated that a suspended motor omnibus service could be resumed if the services of two motor omnibus mechanics and certain spare parts could be obtained.

TREES AND TRAFFIC.—Barnes Urban Council had to pay £16 9s. 6d. damages in respect of a pantechnicon damaged whilst passing along a thoroughfare in which are several trees. The Council has since lopped some of the trees and removed others.

A MOTOR FIRE ENGINE PRESENTED TO NORWICH CITY COUNCIL.—The machine has been purchased by subscription, coming chiefly from local firms. It is of 70 H.P., with a capacity of 500 gallons, and having a sliding carriage telescopic fire escape with a 55 ft. reach.

SPEED INDICATORS FOR FIRE ENGINES.—With a view to checking the consumption of petrol and to the durability of various parts of the machines, Willesden Urban Council propose that the four motor vehicles of the Fire Brigade shall be fitted with speed indicators at a cost not exceeding £45.

OMNIBUS SERVICE WANTED.—Application has been made to the Walsall Corporation by the Birmingham Metal and Munition Company for the running of a motor omnibus service between their works and Walsall Wood and Brownhills. The Corporation is applying for the consent of the local and road authorities concerned.

COAL GAS AS A MOTOR FUEL.—The Automobile Association has received several entries for its competition for a £1,000 prize for the best system for enabling coal gas to be used as fuel for motor vehicles. The closing day for entries is December 31, and all who propose to enter should communicate with the Secretary, Fanum House, Whitcomb Street, London, W.C.2.

ASKING FOR A MOTOR OMNIBUS SERVICE.—A deputation from Ecclesfield Parish Council waited upon the Sheffield Tramway Committee to ask for a motor omnibus service to Grenoside. The deputation was assured that such a service would be run at the earliest possible date, but that, in view of the shortage of men and material, it was impossible to do so at once.

DRIVERS WANTED AGAIN.—The London General Omnibus Company are making application for the return of omnibus drivers from the Army in order to increase the travelling facilities of the metropolis. If this application is granted and sufficient petrol is allotted, the company hope to be able to place several hundred additional omnibuses on the streets in the near future.

ELECTRIC TRUCKS FOR REFUSE COLLECTION.—Hull City Engineer has suggested employing electric warehouse trucks for the collection of street sweepings, and thereby release horses for heavier work. He has been asked by the Cleansing Committee to report further as to the idea and empowered, if necessary, to visit the Chloride Electrical Storage Company's Works, near Manchester.

ELECTRICS AND THE AMERICAN WAR TAX.—At the Health Committee of Sheffield Corporation there was reported an application from the Edison Accumulators, Limited, for an extra allowance in respect of two electric vehicles on order on account of the American war tax and increases of wages authorised by the Ministry of Munitions. The committee recommends that an allowance of £50 per vehicle be granted—from £1,110 to £1,160.

OVERCROWDED OMNIBUSES.—Replying to a question in the House of Commons, Mr. Wardle (Parliamentary Secretary to the Board of Trade) said neither the omnibuses nor the tube railways in the London area were under Government control, but he was confident that the companies concerned were aware of the desirability of improving their transit facilities so far as might be possible in existing circumstances. He was, however, bringing to their notice the point raised in regard to overcrowding.

STOCKTON CORPORATION OMNIBUS SERVICE.—Stockton Corporation have asked the Durham County Council for permission to run a motor omnibus service over a new route from Stockton to Port Clarence. The County Council had already decided that in the case of new services, so far as county roads are concerned, the charges shall be from 1d. to 1½d. per car-mile, and the Highways Committee report in favour of sanctioning the new route on these terms. The 1d. a mile is for vehicles carrying 12 passengers and 1½d. for those carrying 34.

DUNLOP RUBBER COMPANY, LIMITED.—A circular issued by the Secretary of the Dunlop Rubber Company, Limited, states that the issue of the report and balance sheet for the year ended August 31 must be considerably delayed, owing to the continued depletion of the staff and the great increase in business (amounting practically to 50 per cent.). The directors, being of opinion that a further distribution to the ordinary shareholders should be made, have declared an interim dividend for the half year ended August 31 of 1s. 6d. per share on the ordinary shares.

A MAGNETO POINT.—Westminster City Council have had an offer from Messrs. John I. Thornycroft and Company, Limited, to continue the maintenance contract in respect of a motor wagon at the old price of £88 per annum, providing the existing low-tension magneto be replaced by a high-tension magneto, as the former gives a great deal of trouble and expense which could be avoided. As the firm offer to provide the new magneto for £16 10s. and to make no charge for fitting or wiring necessitated by the new installation, the Highways Committee report their acquiescence in the proposal.

PETROL FOR FOOD DELIVERY.—At a meeting of Plymouth Food Committee a letter was received from the Divisional Food Commissioner enclosing a communication from the local traders' organisation with reference to the restriction proposed to be placed on the supply of petrol for road transport for the distribution of foodstuffs, and asking for the observation of the committee. It having been reported that, since the letter was written, the Road Transport Committee had recommended that the radius within which it was intended to confine the delivery of foodstuffs should be enlarged from seven to ten miles of large towns, the committee decided to inform the Divisional Commissioner that probably this concession would go far to meet the views of local traders.

MOTOR VEHICLES FOR MUNICIPALITIES.

BEDFORD CORPORATION are considering the equipment of their fire brigade with motor engines.

GLOUCESTER CITY COUNCIL have under consideration the equipment of a fire float with a motor engine.

HALIFAX CORPORATION are obtaining a motor fire engine with accessories at a cost of about £1,300.

GILLINGHAM TOWN COUNCIL have decided to secure two electric vehicles for the collection of house refuse.

LOFTUS URBAN COUNCIL are considering a proposal to provide a motor ambulance at a cost of about £1,000.

TAUNTON HEALTH, STREETS, AND HIGHWAYS COMMITTEE are considering the purchase of an electric vehicle.

HAMPSHIRE COUNTY COUNCIL are to purchase a small two-seater motor car for the use of the assistant county architect.

WOLVERHAMPTON TOWN COUNCIL have purchased an electrically-propelled lorry from Ransomes, Sims and Jefferies, Limited.

WILLESDEN URBAN COUNCIL are contemplating the purchase of three electric 2-ton vehicles for the collection of house refuse.

WOLVERHAMPTON TOWN COUNCIL have ordered a battery for an electric vehicle from the Chloride Electrical Storage Company, Limited.

LAMBETH BOROUGH COUNCIL are purchasing a steam-driven vacuum gulley emptying wagon from Leyland Motors, Limited, for £675.

ROTHERHAM CORPORATION have been inquiring as to the price of a new motor tower wagon and as to the cost of repairing the present one.

BRAINTREE URBAN COUNCIL are considering the acquisition of a motor to draw the fire engine, owing to difficulty recently experienced in getting horses.

SOUTHEND CORPORATION TRAMWAYS COMMITTEE propose to apply a balance of £1,255 to the credit of the motor omnibus account to the purchase of an electric wagon.

WILLESDEN URBAN COUNCIL have been recommended to purchase three 2-ton vehicles for the collection of house refuse, at £1,151 each, from Ransomes, Sims, and Jeffries, Limited.

LIVERPOOL CORPORATION TRAMWAYS COMMITTEE.

MOTOR OMNIBUSES.

The Liverpool Corporation Tramways Committee are prepared to receive tenders for the supply of a number of Motor Omnibuses.

Tender forms and other particulars can be obtained on application to the General Manager, C. W. Mallins, M.I.A.E., 24, Hatton Garden, Liverpool.

Tenders to be addressed to the Town Clerk at his Office, Municipal Buildings, Dale Street, Liverpool, and to be received not later than 12 noon on the 31st instant, endorsed "Tender for Motor Omnibuses."

E. R. PICKMERE, M.A.,
Town Clerk.

Liverpool, 9th December, 1918.

Digitized by Google

THE TRAMWAY AND RAILWAY WORLD.
(REGISTERED AS A NEWSPAPER.)
FOUNDED, 1892.

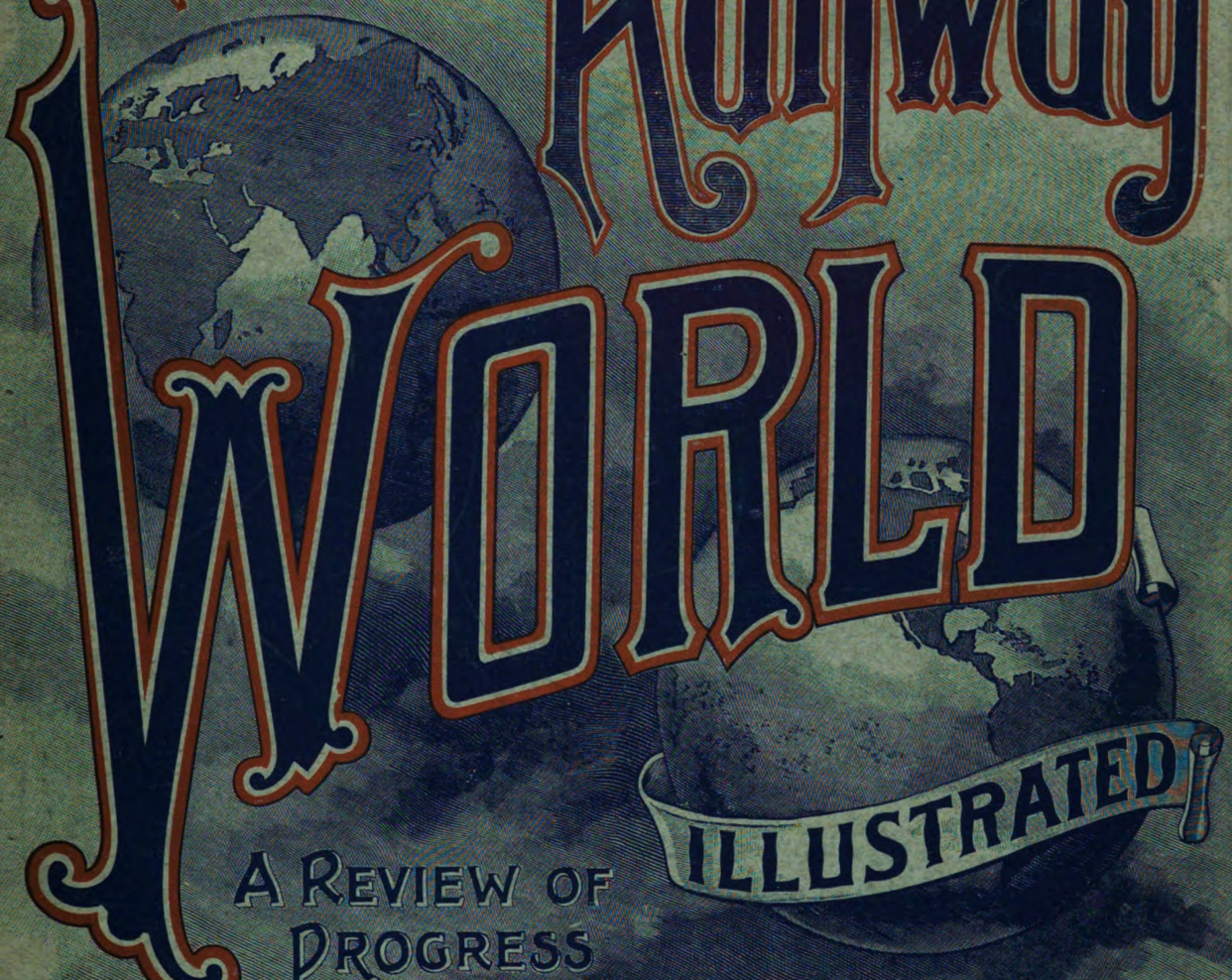
PRICE ONE SHILLING

JULY 11, 1918
Vol. XLIV., No. 2
WITH
"MOTOR TRAFFIC" SECTION

Contents, Page xi.
Index to Advertisements, Page xiii.

Offices: AMBERLEY HOUSE, NORFOLK STREET, LONDON, W.C.2
Telegrams, "TRAMIGRO, LONDON."
Telephone No., "GERRARD 2948."

The Tramway and Railway WORLD



ILLUSTRATED

A REVIEW OF PROGRESS IN Electric AND OTHER Traction.

LARGEST MAKERS OF COAL AND ASH HANDLING PLANT IN THE KINGDOM

WITH a "Bennis" equipment the coal can be carried direct to the hoppers of the Mechanical Stokers, eliminating costly labour, saving time and waste in handling, while "Bennis" Mechanical Stokers will give an increased steam output with low price coal.

Write for our new 64-page Catalogue on Coal and Ash Plant.

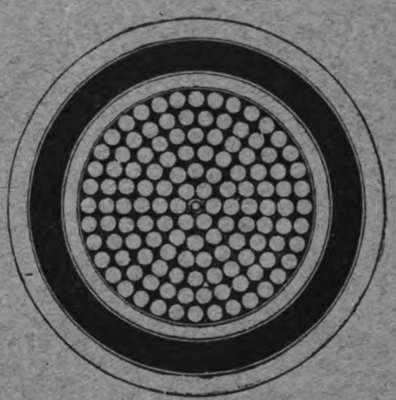
ED. BENNIS & CO. LTD., Little Hulton, BOLTON, and 28 Victoria Street, Westminster, LONDON S.W.1

Bennis Little Hulton
Bennis London

Farnworth 13
Victoria 627

Digitized by Google

MACINTOSH
CABLES



Section of positive feeder cable now being supplied and installed for the London and South Western Railway suburban electrification.

CHAS. MACINTOSH & CO., LTD.,

Electrical Engineers & Cable Manufacturers.

Works:
MANCHESTER,
DERBY,
LIVERPOOL.

London Office:
22-23, JEWIN STREET,
E.C.

Digitized by Google

HOYT BEARING METALS.

HOYT ANTI-FRICTION METALS GIVE

MAXIMUM MILEAGE.

FULLEST PARTICULARS, PRICES, SAMPLES, COMPARISONS AND MOST CAREFUL CONSIDERATION ON REQUEST.

ORDER A TRIAL LOT,

AND LET PAYMENT DEPEND UPON YOUR SATISFACTION.

THE HOYT METAL CO., LTD.,

(WORKS: MILLWALL, E.) 26, BILLITER STREET, LONDON, E.C.3.

"GROVER SPRING WASHER" NUT-LOCK

FOR . . .
FISH BOLTS (Iron or Steel)
ROLLING STOCK,
SIGNAL WORK, &
GENERAL PURPOSES,
ELECTRICAL WORK, &c.

BEWARE OF ALL CHEAP IMITATIONS
They are like the original in appearance only.

SALES OVER 135,000,000.
Made in all sizes from $\frac{3}{16}$ in. to 4 inches, and in Millimetres.

GROVER & Co. Ltd. Britannia Engineering Works, Carpenters Rd., Stratford, London, E. Telegraphic Address: "ADOPTED, STRAT, LONDON." Telephone STRATFORD 984-985.

SIMPLEX LEAD GLAZING

FOR ROOFS, SKYLIGHTS, & HORTICULTURAL WORK.
No Special Contract Required.

NO ZINC, IRON, OR PUTTY USED.

ANY QUANTITY SUPPLIED.

Millions of superficial feet in use on thousands of Structures.

Write for full Illustrations, Testimonials, and Particulars (sent post free).

Are You Satisfied With Your Ticket Service ?

Telegrams "TICKETS, GLASGOW"

If you ask that question of the managers of the largest tramway undertakings, both at home and abroad, the answer will be—

"Yes, we use Glasgow Tickets."

May we send you some specimens? We produce tickets in any style, in any quantity, and print in any language.

Whenever you want tickets, either paper or pulp, we shall be pleased to quote you.

Freedom from ticket worry will be assured if you send your orders to

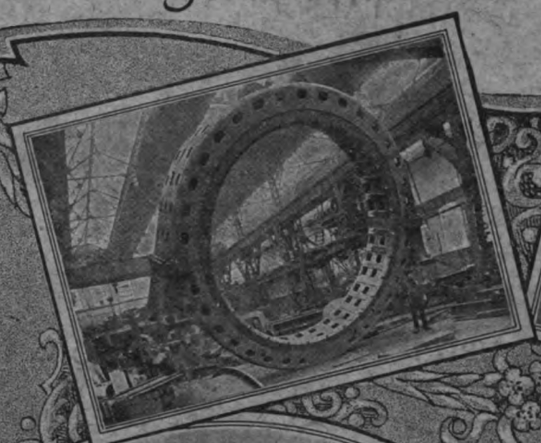
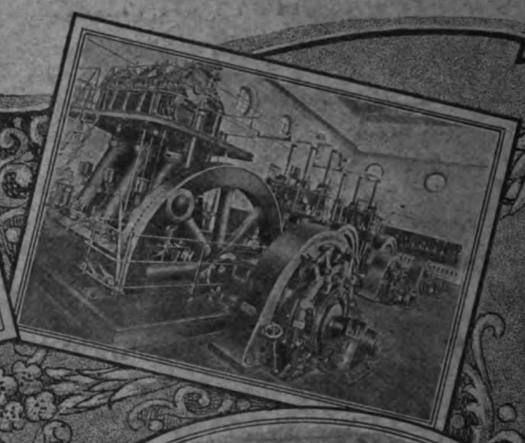
GLASGOW NUMERICAL TICKET AND CHECK BOOK PRINTING CO. LTD.
31 FINNIESTON STREET, GLASGOW

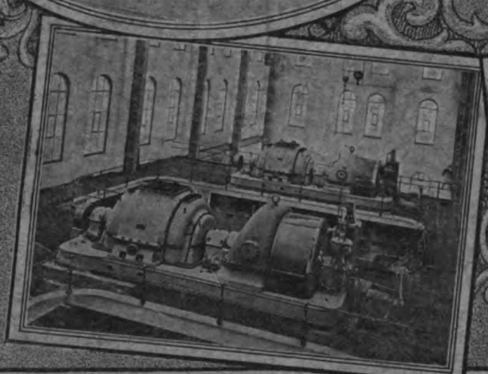
Printed for the Proprietors by Chorley & Pickersgill, Ltd., The Electric Press, Leeds, and Published by the Proprietors at their Offices at Amberley House, Norfolk Street, London, W.C.

Digitized by Google

DICK, KERR & Co. LIMITED

Engineers and Contractors



MANUFACTURERS OF:—A.C. & D.C. Generators, Motors, Rotary Converters, Steam Turbines, Electric Lamps, Electric Traction Equipments, Diesel Oil Engines, Tramcar Bodies, Locos, &c.,
CONTRACTORS FOR:—The complete construction and Electrification of Railways & Tramways, the equipment of Electric Light & Power Stations, and the construction of Sewage Works & Reservoirs.

Head Office: ABCHURCH YARD, CANNON ST, LONDON, ENGLAND
Branches: Manchester, Newcastle, Tokyo, Sydney, Johannesburg, Buenos Aires, Rio de Janeiro & Milan.

Digitized by Google

THE TRAMWAY AND RAILWAY WORLD.
(REGISTERED AS A NEWSPAPER.)
FOUNDED, 1892.

PRICE ONE SHILLING

AUGUST 15, 1918
Vol. XLIV., No. 8
WITH
"MOTOR TRAFFIC" SECTION

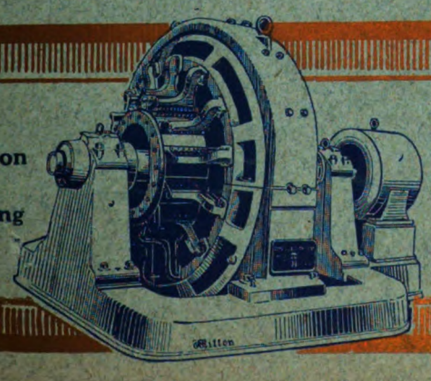
Contents, Page xi.
Index to Advertisements, Page xiii.

Offices: AMBERLEY HOUSE, NORFOLK STREET, LONDON, W.C.2
Telegrams, "TRAMIGRO, LONDON."
Telephone No., "GERRARD 2948."

The Tramway and Railway WORLD

ILLUSTRATED

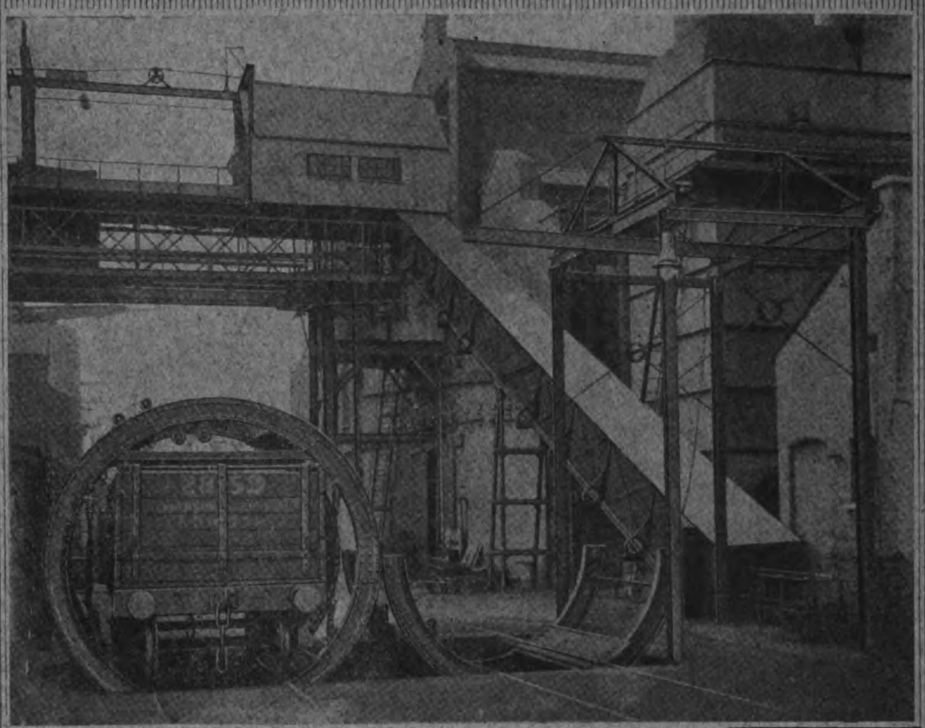
A REVIEW OF PROGRESS IN *Electric* AND OTHER *Traction.*



For Traction and Lighting

G.E.C. Witton
ROTARY CONVERTERS

Digitized by Google



THE best and quickest way of unloading coal is to use a "BENNIS" Truck Tippler. In the illustration is shown such a Tippler installed at a famous railway company's works. After discharge, the coal is carried by elevator to a conveyor which delivers it direct to the stoker hoppers. Send to-day for our new catalogue on

Bennis Rotary TRUCK TIPPLERS

ED. BENNIS
& CO. LTD.
LITTLE HULTON, BOLTON
and 28 Victoria Street, London S.W

Digitized by Google

THE TRAMWAY AND RAILWAY WORLD.
(REGISTERED AS A NEWSPAPER.)
FOUNDED, 1892.

PRICE ONE SHILLING

SEPTEMBER 12, 1918
Vol. XLIV., No. 13
WITH
"MOTOR TRAFFIC" SECTION

Contents, Page xi.
Index to Advertisements, Page xiii.

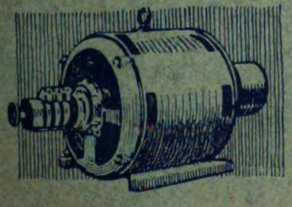
Offices: AMBERLEY HOUSE, NORFOLK STREET, LONDON, W.C.2
Telegrams, "TRAMIGRO, LONDON."
Telephone No., "GERRARD 2948."

NOV 15 1918 D

The Tramway and Railway WORLD

ILLUSTRATED

A REVIEW OF PROGRESS IN *Electric* AND OTHER *Traction.*



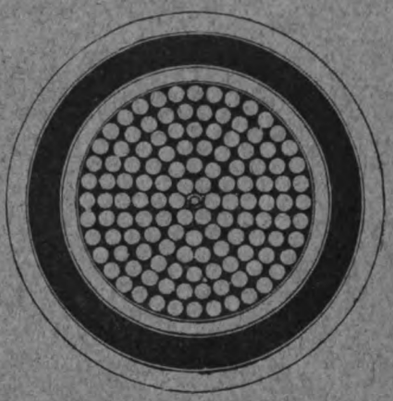
Witton
Motors
FOR INDIVIDUAL & COLLECTIVE DRIVING OF MACHINERY
ENGINEERING WORKS WITTON, BIRMINGHAM.

The GENERAL ELECTRIC COMPANY Ltd.
HEAD OFFICE
QUEEN VICTORIA STREET
LONDON:
KNOWN THROUGHOUT THE WORLD AS THE
G.E.C.

REGISTERED TRADE MARK

Digitized by Google

MACINTOSH
CABLES



Section of positive feeder cable now being supplied and installed for the London and South Western Railway suburban electrification.

CHAS. MACINTOSH & CO., LTD.,

Electrical Engineers & Cable Manufacturers.

Works:
MANCHESTER,
DERBY,
LIVERPOOL.

London Office:
22-23, JEWIN STREET,
E.C.

Digitized by Google

THE TRAMWAY AND RAILWAY WORLD.
(REGISTERED AS A NEWSPAPER.)
FOUNDED, 1892.

PRICE ONE SHILLING

OCTOBER 17, 1918
Vol. XLIV., No. 19
WITH
"MOTOR TRAFFIC" SECTION

Contents, Page xi.
Index to Advertisements, Page xiii.

Offices: AMBERLEY HOUSE, NORFOLK STREET, LONDON, W.C.2
Telegrams, "TRAMIGRO, LONDON."
Telephone No., "GERRARD 2948."

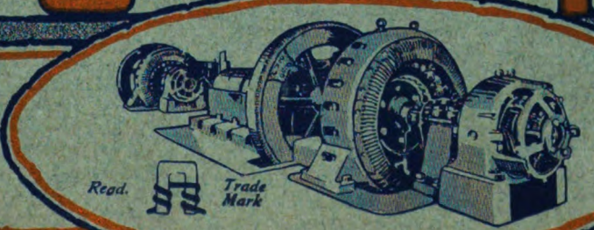
The Tramway and Railway WORLD

ILLUSTRATED

A REVIEW OF PROGRESS IN *Electric* AND OTHER *Traction.*

G·E·C· Electrical PLANT

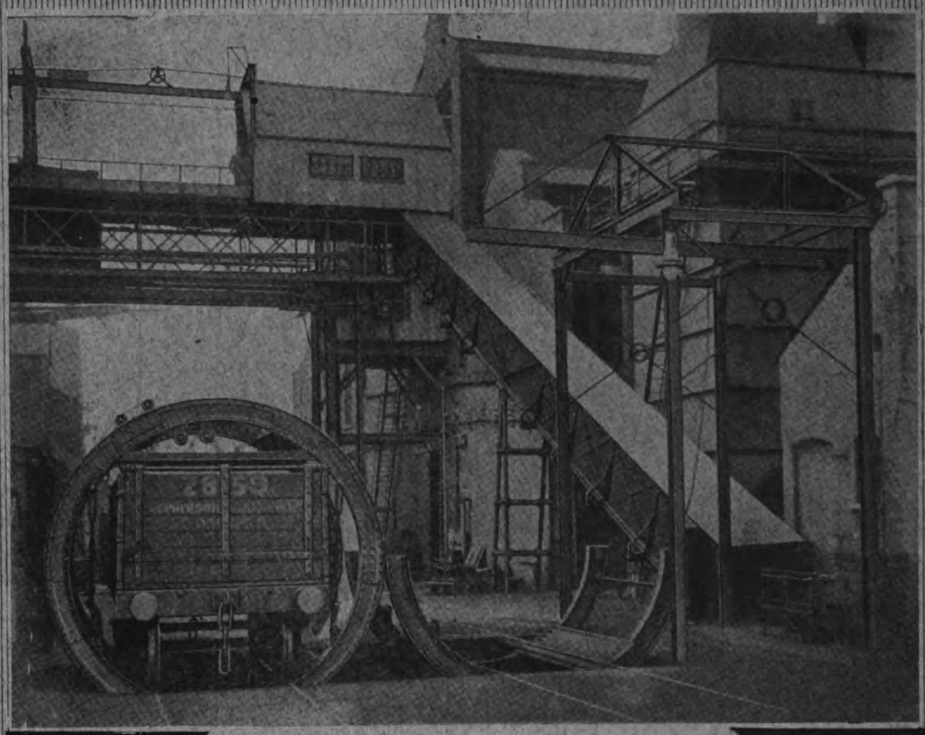
The Alternators illustrated are driven by horizontal internal combustion engines. Good parallel running is successfully attained in spite of the difficulties due to this form of drive.



Highest Possible Efficiency and Unfailing Service all the year round. These are the outstanding characteristics of G.E.C. Electrical Plant.

The General Electric Co. Ltd., Queen Victoria Street, London.

Digitized by Google



THE best and quickest way of unloading coal is to use a "BENNIS" Truck Tippler. In the illustration is shown such a Tippler installed at a famous railway company's works. After discharge, the coal is carried by elevator to a conveyor which delivers it direct to the stoker hoppers. Send to-day for our new catalogue on

Bennis Rotary TRUCK TIPPLERS

ED. BENNIS
& CO. LTD.
LITTLE HULTON, BOLTON
and 28 Victoria Street, London S.W

Digitized by Google

THE TRAMWAY AND RAILWAY WORLD.
(REGISTERED AS A NEWSPAPER.)
FOUNDED, 1892.

PRICE ONE SHILLING

NOVEMBER 14, 1918
Vol. XLIV., No. 23
WITH
"MOTOR TRAFFIC" SECTION

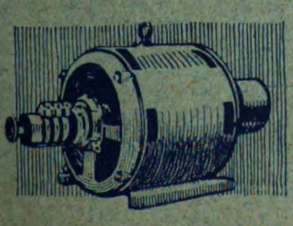
Contents, Page xi.
Index to Advertisements, Page xiii.

Offices: AMBERLEY HOUSE, NORFOLK STREET, LONDON, W.C.2
Telegrams, "TRAMIGRO, LONDON."
Telephone No., "GERRARD 2948."

The Tramway and Railway WORLD

ILLUSTRATED

A REVIEW OF PROGRESS IN Electric AND OTHER Traction.



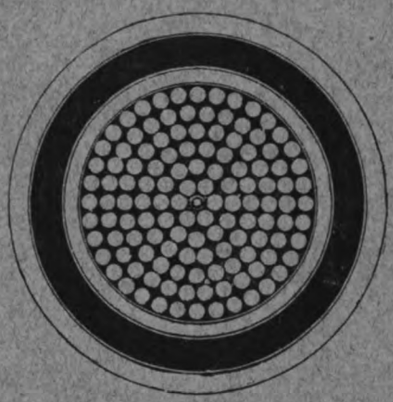
Witton Motors
FOR INDIVIDUAL & COLLECTIVE DRIVING OF MACHINERY
ENGINEERING WORKS WITTON, BIRMINGHAM.

The GENERAL ELECTRIC COMPANY LTD.
HEAD OFFICE
QUEEN VICTORIA STREET LONDON:
KNOWN THROUGHOUT THE WORLD AS THE G.E.C.

REGISTERED TRADE MARK

Digitized by Google

MACINTOSH
CABLES



Section of positive feeder cable now being supplied and installed for the London and South Western Railway suburban electrification.

CHAS. MACINTOSH & CO., LTD.,

Electrical Engineers & Cable Manufacturers.

Works:
MANCHESTER,
DERBY,
LIVERPOOL.

London Office:
22-23, JEWIN STREET,
E.C.

Digitized by Google

THE TRAMWAY AND RAILWAY WORLD.
(REGISTERED AS A NEWSPAPER.)
FOUNDED, 1892.

PRICE ONE SHILLING

DECEMBER 19, 1918
Vol. XLIV., No. 30
WITH
"MOTOR TRAFFIC" SECTION

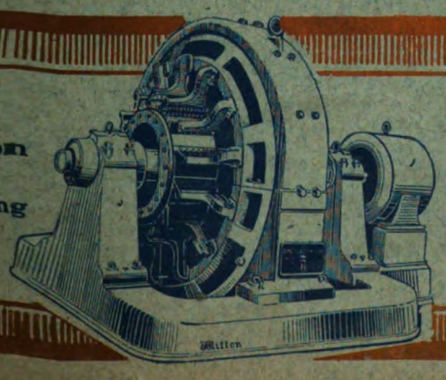
Contents, Page xi.
Index to Advertisements, Page xiii.

Offices: AMBERLEY HOUSE, NORFOLK STREET, LONDON, W.C.2
Telegrams, "TRAMIGRO, LONDON."
Telephone No., "GERRARD 2948."

The Tramway and Railway WORLD

ILLUSTRATED

A REVIEW OF PROGRESS IN Electric AND OTHER Traction.



For Traction and Lighting

G.E.C. Witton
ROTARY CONVERTERS

Digitized by Google

Out!

COPIES of our new catalogue on Coal and Ash Plant are now available for distribution and will be sent to any bona fide enquirer on receipt of a written request. It is a well printed, fully illustrated book, descriptive of the latest and most approved methods of handling coal and ashes rapidly, efficiently and without waste or the use of costly labour.

COAL & ASH PLANT CATALOGUE

We are at all times pleased to place our expert advice and assistance at the disposal of prospective customers. Tell us your problem and we will set to work to provide a solution.

ED. BENNIS & CO., LTD
Little Hulton, Bolton; and
28 Victoria Street, London, S.W.1

6765

Digitized by Google

THERMIT

REG. TRADE MARK.

All materials made by British labour at our own Works

Important Announcement

The whole of the shares of THERMIT LIMITED are owned by

NOBEL'S EXPLOSIVES CO. LTD.

THERMIT, LIMITED, originally established in 1904, are the owners of the Alumino-Thermic Process Patents, and are in no way connected with any other firm or firms adopting somewhat similar titles.

THERMIT

REG. TRADE MARK.

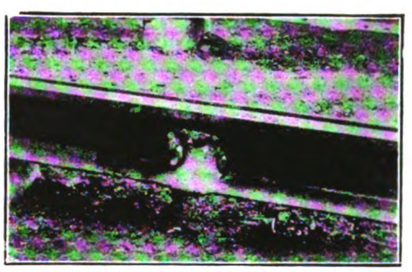
Entirely British owned and managed

We are the Pioneers in THERMIT Welding in the U.K. We guarantee all joints made with our THERMIT by our trained men. We not only weld new rails on new and reconstruction work, but we are now able to place at your disposal a satisfactory process for welding joints on existing track.

OUR THERMIT JOINTS

Will reduce your maintenance costs and add years to the life of your rails and track.
Ensure a permanently smooth rolling surface and prevent any knocking noise such as is caused by cars passing over uneven joints.
Give a perfect and permanent electrical conductivity without the use of bonds.

Rail Welding



Finished Thermit Joint

THERMIT joints have stood the test of many years' traffic on most of the leading tramway systems of the U.K. and the Colonies.

Our knowledge and experience are at your disposal

THERMIT, LIMITED

(Proprietors: NOBEL'S EXPLOSIVES CO. Ltd.)
Office & Works—675 Commercial Road, LONDON E.14

Telegrams
"FULMEN PHONE LONDON"

Telephone
EAST 4157

Digitized by Google

TRAMWAY FOUNDATIONS

Tramway, Treherbert, for Rhondda Tramways Co. Ltd. Engineer: H. Holliday, Esq., A.M.I.E.E.
Tramway foundation reinforced with B.R.C. Fabric.

B.R.C. Fabric laid in sheets in the concrete foundation transversely to the rails, so strengthens the foundation that the wheel loads are spread over the full width of ground below the concrete. The result is a level track.

The British Reinforced Concrete Engineering Co., Ltd., Head Office: 1, Dickinson Street, Manchester Works: Trafford Park, Manchester

BRC Fabric

London: 36, Lime Street
Birmingham: 118, New St.
Liverpool: 36, Dale St.
Newcastle-on-Tyne: 2, St. Nicholas Buildings
Sheffield: 38, Church St.
Glasgow: 62, Robertson St.

B·R·C

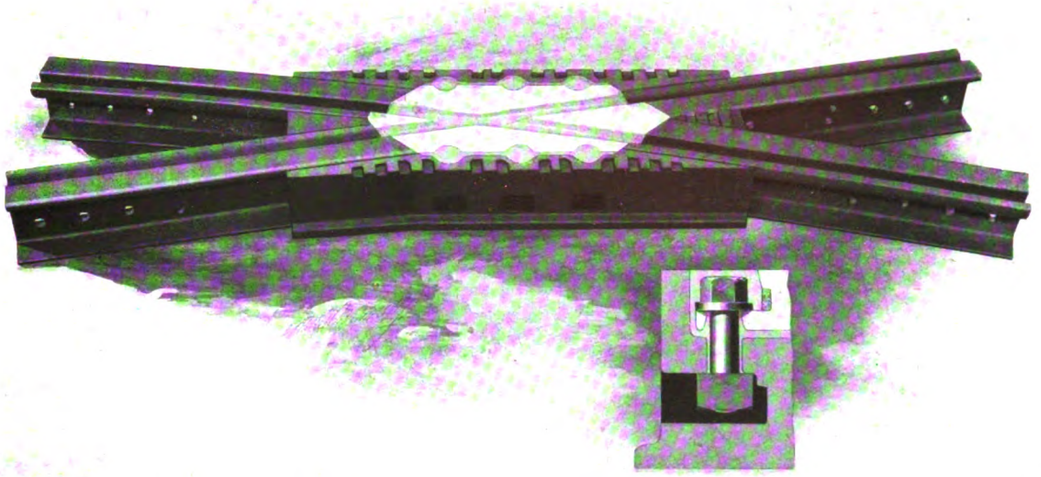
Digitized by Google

Telegrams
"STEELMAKER LONDON"

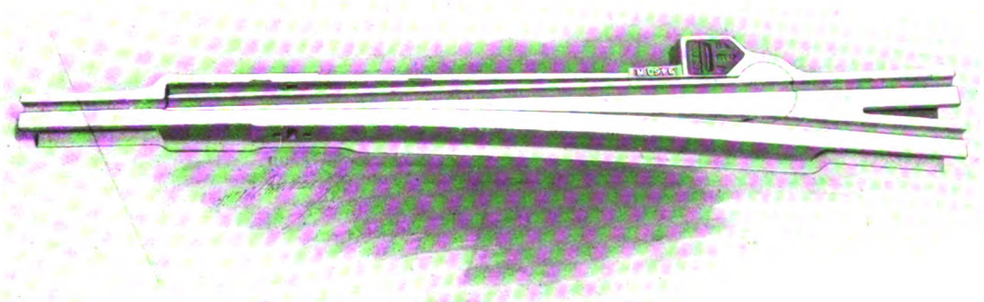
Telephone
8185 LONDON WALL

LORAIN SPECIAL WORK

Awarded "GRAND PRIZE" at Panama-Pacific International Exposition 1915



Ironbound "Guarantee" Construction with Manganese Steel Inserts fastened to machined bed with Heat Treated Chromium Steel Bolts run in with white metal and caulked



SOLID MANGANESE TADPOLE TONGUE SWITCH
Made with either grooved or plain Tongue

Apply—UNITED STATES STEEL PRODUCTS CO.
36-38 New Broad Street London E.C.2

Digitized by Google

CONTRACTORS FOR

COMPLETE ELECTRIC RAILWAY & TRAMWAY INSTALLATIONS

L. & Y. CO.'S ELECTRIC TRAIN. 1,200 VOLT THIRD RAIL SYSTEM EQUIPPED WITH DICK, KERR AUTOMATIC MULTIPLE-UNIT CONTROL

DICK, KERR & CO. LTD.

incorporating

WILLANS & ROBINSON LTD.
THE UNITED ELECTRIC CAR CO. LTD.

Working in conjunction with SIEMENS BROS. & CO. LTD.
THE PHOENIX DYNAMO MFG. CO. LTD.

DICK, KERR | PHOENIX | SIEMENS

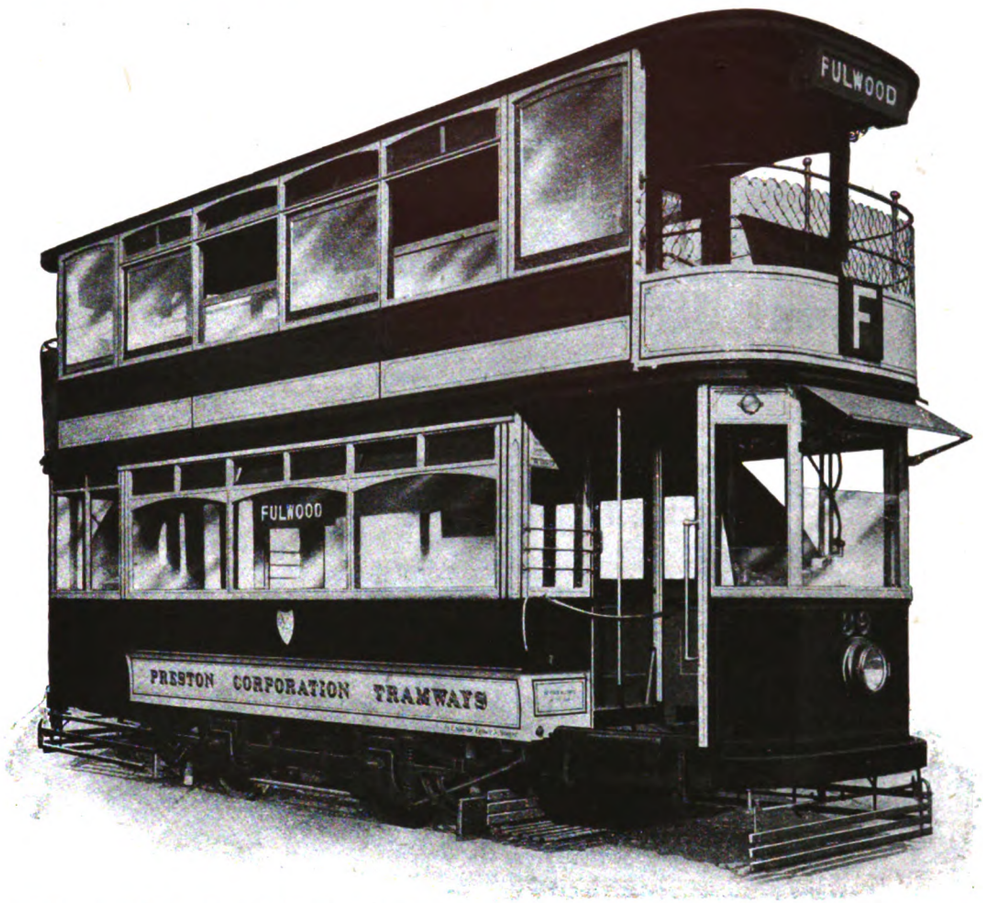
Digitized by Google

MANUFACTURERS OF

ELECTRIC POWER & TRACTION EQUIPMENT
RAILWAY & TRAMWAY ROLLING STOCK
CAR FURNISHINGS &c.

U. E. C.
ROLLING STOCK

Railway and
Tramway Vehicles
For Passenger and
Freight Service
Tramway Water-
Cars and Track
Sweepers
Car Trucks
Omnibus and
Rail-Motor Car
Bodies &c.



TOP SEAT CAR WITH TOP COVER MOUNTED ON PRESTON PATENT FLEXIBLE AXLE TRUCK, AS SUPPLIED TO THE PRESTON CORPORATION TRAMWAYS

HEAD OFFICE—ABCHURCH YARD
CANNON STREET
LONDON E.C. 4

BRANCHES—London, Cardiff, Sheffield, Manchester, Newcastle, Glasgow, Belfast
Tokyo, Sydney, Johannesburg, Buenos Aires, Rio de Janeiro & Milan

Digitized by Google

THE

RAIL WELDING COMPANY

119 Victoria Street, Westminster, LONDON S.W.1

ELECTRIC RAIL WELDING FOR NEW AND EXISTING RAILS

The only process by which the premature renewal of rails owing to defective joints can be avoided, the life of the rails prolonged for several years, and silent running ensured.

(Until recently carried out by The Rail Welding Dept. of the Tudor Accumulator Co. Ltd.)

THIS PROCESS HAS BEEN CARRIED OUT ON THE FOLLOWING UNDERTAKINGS

ABERDEEN	LEITH	NEWPORT	SALFORD
BRADFORD	LIVERPOOL	OLDHAM	SHEFFIELD
DUNDEE	MANCHESTER	PAISLEY	STOCKPORT
GLASGOW	MIDDLETON	ROCHDALE	SUNDERLAND
HALIFAX	NEWCASTLE	ROTHERHAM	WEST HAM

A

TERRY

Contract

ensures reliable supply of any magnitude. We can plan for millions, no matter what design of article, metal or finish. Prints or samples should be sent now for prices and contract terms.

May we quote for your needs?

HERBERT TERRY & SONS, LTD.
The Spring and Presswork Specialists, Redditch England
ESTAB. 1855.

BRIMSDOWN WHITE LEAD

AND

BATTERY LITHARGE

OFFICE & WORKS

BRIMSDOWN LEAD CO. LTD.

BRIMSDOWN

MIDDLESEX

TELEPHONE
WALTHAM CROSS 132

TELEGRAMS
HYDRATION ENFIELD

Digitized by Google

Turner's Patent Automatic Point Controllers

ARE THE MOST RELIABLE AND EFFICIENT

- Manufacturers of
- Overhead Line Materials
- Frogs
- Crossings
- Section Insulators
- Ears
- Hangers &c. &c.

- Electric Car Fittings
- Controller Fingers
- And all Accessories

Over 500 Installed in Great Britain alone
This is proof of satisfaction

TRAMWAY SUPPLIES LTD.

Engineers and Manufacturers

Woodhouse Lane
LEEDS

Telegrams "Controller Leeds"
Telephone No. 26883 Leeds

Digitized by Google

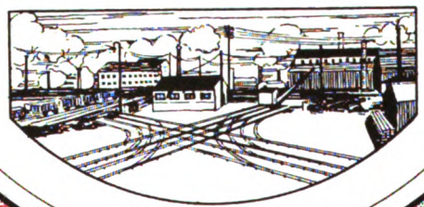
'ERA'

Manganese Steel

(HADFIELD'S PATENT.)

The Material that Stands Alone for Electric Railway & Tramway Points & Crossings, Special Track Work etc.,

Sheffield's largest and most important junction, constructed entirely of Hadfield's Patent 'ERA' MANGANESE STEEL



HADFIELDS LTD

HECLA & EAST HECLA WORKS

WORKS AREA OVER 200 ACRES

SHEFFIELD

WORKMEN EMPLOYED OVER 15,000

Digitized by Google

CONTENTS

	Page
Standardisation of Electric Track Equipment	341
Third Rail Design for Railway Electrification (Illus.)	342
The Channel Train Ferry (Illus.)	346
Aerial Traffic	348
The District Railway Jubilee (Illus.)	349
Editorial Comments—Development of Transport	352
Railway Unification	352
Tramway Organisation	353
Improvement of Transportation	354
Relaxation of Control of Materials	355
Final Report of the Select Committee on Transport	356
Tramway and Omnibus Workers' Claims	358
Tramway Chairmen for 1918-19	359
Eight-Hour Day for Railwaymen	359
Dick, Kerr & Company, Limited	360
Financial Reports and Meetings	361
Contracts and Orders	363
Personal	363
Tramway and Light Railway Notes	364
Patent List	365
MOTOR TRAFFIC SECTION	369
Road Transport Board	370
Petrol Restriction Relaxed	371
The Cippenham Motor Depot Scheme	371
Motor Omnibus Maintenance	372
Steam Wagons for Fuel Economy	372
Standardisation of Rubber Tires	372
Thornycroft Vehicles in War Service (Illus.)	373
Motor Traffic Notes	374
Motor Vehicles for Municipalities	374
Traffic Returns	366
Directories of Electric Tramways and Railways	xxiii-xxvi
Municipal Tramways	xxiii-xxiv
Company Tramways	xxiv-xxvi
Tramways (Board of Trade) Committee	xxvi
Area Sub-Committees	xxvi
Buyer's Guide	xvi-xx
Index to Advertisements	xiii

THE PARAGON EARTH CONE

is the safest, surest and most reliable. Careful tests have proved that its geometrical form provides a good contact. Will carry heavy currents for short periods without overheating. THE PARAGON EARTH CONE is made of pure copper—perforated—and filled with charcoal. This attracts the moisture and ensures a certain contact. Suitable for Electric Railways, Tramways, Telegraph, Telephone, Electric Light, Power, Lightning Conductors, etc.

Write to-day for Illustrated Folder

SCHOLEY & CO. LTD., 56, VICTORIA STREET, LONDON, S.W.1

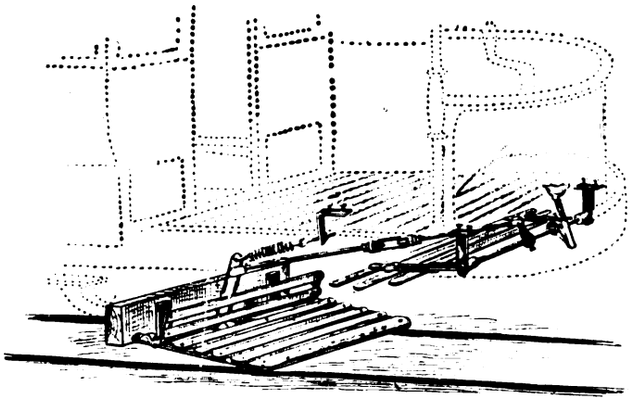
Digitized by Google

GABRIEL & CO.

The "Save All" Lifeguard. Patent No. 786/1908

Gabriel's Patent

Megaphone
Anti Rattlers
Sanding Devices
Door Locks
Drivers' Bells
Conductors' Bells



Gabriel's Patent

Runner Bars
Route Indicators

Sole Makers of Clarus Aluminium Alloy for Tramcar and Railway Carriage Fittings &c.

With the view of minimising fatal accidents, tramway managers should specify this guard on all new rolling stock. It has never been known to fail, and has saved numerous lives, including the eldest son of the patentee.

RAILWAY CARRIAGE & TRAMCAR FITTINGS A SPECIALITY

(Orders for Tramcar Fittings and Spares should be placed at once to ensure prompt delivery)

Contractors to Admiralty, War Office, Air Board, and Ministry of Munitions

Catalogue on Application

A B ROW, BIRMINGHAM

ALFRED WISEMAN LTD

Mechanical and Electrical Engineers, Ironfounders, Machinists and Contractors

Manufacturers of

OVERHEAD LINE MATERIAL
LONG DISTANCE TRANSMISSION LINES
MOULDED INSULATION TRAMWAY GEARS & PINIONS
CUT GEARING ENGINEERING SPECIALITIES
ALUMINIUM CASTINGS GUN METAL CASTINGS
IRON CASTINGS SCALES AND WEIGHING MACHINES
FINISHED PARTS FOR MOTOR INDUSTRY

GLOVER STREET - BIRMINGHAM

Telegrams—"VERUS BIRMINGHAM" Telephone—VICTORIA 560 & 561 BIRMINGHAM

Digitized by Google

INDEX TO ADVERTISEMENTS.

	PAGE
Aerograph Co. Ltd., The, London, E.C.	126
Albion Motor Car Co. Ltd., Scotstoun, Glasgow ...	xv
Allen, Edgar & Co., Ltd., Sheffield	146
Allen & Simmonds, Ltd., Reading	132
André Sleigh & Anglo Ltd., London, W.C. ...	—
Anger Manufacturing and Supply Co. Ltd., Preston	xxxvi
Attwater & Sons, Preston	xvi, 365
Austin Motor Co. Limited, Birmingham ...	xiv, 137
Auto-Ticket Printing Co. Ltd., Liverpool	—
Avon India Rubber Co. Ltd., London	140
Baker, John & Co. (Rotherham), Ltd., Rotherham	xxii
Beckett, Laycock & Watkinson, Ltd., Willesden ...	xx
Bell Punching & Printing Co. Ltd., London, E.C.	144
Bennis, Ed. & Co. Ltd., Bolton and London, S.W.	ii
Bowater, W. V. & Sons, London, E.C.	134
Brill Company, J. G., London, E.C....	xxxi
Brimsdown Lead Co. Ltd., Brimsdown, Middlesex...	viii
Britannia Lamp & Accessories Co. Ltd., London, E.C.	—
British Insulated & Helsby Cables, Ltd., Prescot ...	xxvii
British Reinforced Concrete Engineering Co. Ltd., Manchester	iv
British Thomson-Houston Co. Ltd., Rugby ...	xxx
British Westinghouse Electric & Manufacturing Co., Ltd., Manchester	xix
Brockhouse, J. & Co. Ltd., West Bromwich ...	145
Brown, David & Sons, Ltd., Lockwood, Huddersfield	128
Chloride Electrical Storage Co. Ltd., Manchester	130
Clayton & Co. (Huddersfield) Ltd., Huddersfield...	128
Coan, R. W., 219, Goswell Road, London, E.C. ...	xviii
Cole, Wm. & Sons, Ltd., London, W.	141
Commercial Cars, Ltd., Luton	139
Courtenay, J. W., Ltd., London, W.C.	xxxv
Coventry Chain Co. Ltd., Coventry...	130
Daimler Co. Ltd., Coventry	367
Dennis Bros., Guildford	124
Dick, Kerr & Co. Ltd., London, E.C. ... vi, vii,	148
Dick, W. B. & Co. Ltd., 90, Fenchurch St., E.C. ...	132
Docker Brothers, Ltd., London, E.C.	144
Dunlop Rubber Co., Ltd., Aston Cross, Birmingham	129
Electro-Mechanical Brake Co. Ltd., West Bromwich	xxxviii
Equipment & Engineering Co., London, W.C.	xxviii, xxix
Fleming, Birkby & Goodall, Ltd., Liversedge ...	xxi
Fodens, Ltd., Sandbach	142
Gabriel & Co., A B Row, Birmingham	xii
General Electric Co. Ltd., London, E.C.	i
General Seating Co. Ltd., London, E.C.	xxxiv
Glasgow Numerical Ticket Printing Co., Glasgow ...	147
Green, Geo. W. & Co. (Feltham) Ltd., Feltham ...	145
Grover & Co. Ltd., Stratford, London, E.	147

	PAGE
Hadfields, Ltd., Sheffield	x
Halley's Industrial Motors, Ltd., Glasgow	126
Henley's Telegraph Works Co. Ltd., London, E.C....	xix
Henley's Tyre and Rubber Co., Ltd., London, E.C.	135
Herbert Frood Co. Ltd., Chapel-en-le-Frith ...	130
Hoyt Metal Co. Ltd., London, E.C.	147
Hurst, Nelson & Co. Ltd., Motherwell	xxxvii
Johnson & Phillips, Ltd., London, S.E.	xxxviii
Kalker, E. & Co., Coventry	xxx
Kearsley, Robert & Co. Ltd., Ripon...	xviii
Lacre Motor Car Co., 78, York Road, London ...	133
Leyland Motors (1914) Ltd., Leyland	131
Lorain Special Work, London, E.C....	v
Mackintosh, Chas. & Co. Ltd., Manchester	xiv
Maudslay Motor Co. Ltd., 4, Parkside, Coventry ...	134
Mirrlees Watson Co. Ltd., Glasgow	365
Motor Traction, 20, Tudor Street, London, E.C. ...	xviii
National Electric Construction Co. Ltd., London ...	xiii
Napier, D. & Son, Ltd., London, W....	368
North British Rubber Co. Ltd., Edinburgh ...	136
Osborne, C., Longsight, Manchester	368
Pease & Partners, Ltd., Middlesbrough	xxii
Pinchin, Johnson & Co. Ltd., London, E.C. ...	xxx
Rail Welding Co., London, S.W.	viii
Scholey & Co. Ltd., London, S.W.	xi
Shrewsbury & Challiner Tyre Co. Ltd., Manchester	xiv, 125
Simplex Conduits Ltd., Birmingham...	144
Skefko Ball Bearing Co. Ltd., Luton	—
Smith, Frederick & Co. Ltd., Salford, Manchester	—
Smith, S. & Sons, London, W.	138
Spencer-Moulton & Co. Ltd., Deansgate, Manchester	123
Standard Underground Cable Co., London, E.C. ...	xvi
Stevens Petrol-Electric Vehicles Ltd., London, S.W.	127
Stewarts & Lloyds, 41, Oswald Street, Glasgow ...	145
Straker-Squire, Ltd., London, S.E.	124
Terry, Herbert & Sons Ltd., Redditch	viii
Thermit, Ltd., London, E.C.	iii
Tilling-Stevens, Ltd., Victoria Works, Maidstone ...	121
Titan Trackwork Co. Ltd., Sheffield	xv
Tramway Supplies, Ltd., Leeds	ix
Triplex Safety Glass Co. Ltd., London, W.... ...	365
Tyne Metal Co. Ltd., Newcastle-upon-Tyne ...	145
Underground Electric Rly. Co. Ltd., London ...	xiv
Vislok Ltd., 3, St. Bride's House, London, E.C. ...	xxxiii
Waygood-Otis, Ltd., Falmouth Road, London, S.E.	xvi
White Motors and Accessories, Ltd., London, S.W.	xvii
Williamson, Alfred, Ashton-under-Lyne	126
Wiseman, Alfred, Ltd., Glover Street, Birmingham	xii
Wood-Milne, Ltd. Preston	143

THE NATIONAL ELECTRIC CONSTRUCTION CO. LIMITED

Contractors to the Admiralty, War Office and Air Ministry

undertake complete contracts for Tramway Construction Town Lighting and Electrical Work of every description

Complete Tramway contracts, including power house and permanent way, have been carried out at Rhondda Valley; Torquay; Musselburgh; Mexboro', Rawmarsh and Swinton; Dewsbury, Ossett and Soothill Nether.

Complete Town Lighting contracts have been carried out at Bo'ness, Scotland; Carnarvon; Holyhead; Kildare; Musselburgh; Wisbech; Rawmarsh, Swinton &c.

Telephone Nos. City 6616 & 6617

62 & 63 QUEEN STREET, LONDON E.C.4

Digitized by Google

MATERIAL FOR DISPOSAL

One 10-ton Road Roller, by Fowler, working pressure 120 lbs.
One 10-ton Road Roller, by Clayton & Shuttleworth, working pressure 150 lbs.
Two Motor Road Rollers, by Barford & Perkins.
Two 12-ton Crane Type Navvies, by Wilson.
One 10-ton ditto ditto.
One 8-ton ditto ditto.
One 10-ton ditto, by Whittaker.
Five 6-wheel Coupled Locomotives, 12 in. cylinders, 140 lbs. working pressure.
Two Wallis & Stevens' Steam Tractors.
One Fielding & Platt Accumulator, 6 in. diameter, 10 ft. stroke, 1,500 working pressure.
Steam Winch. Four Electric Hoists.
Mortar Mill. One Mile of 2 ft. Jubilee Track.
72 One-yard Side Tipping Wagons, 2 ft. gauge.
Cochrane Boiler, about 3,000 lbs. evaporation per hour.

Prices and particulars on application. Inspection by appointment.

The AUSTIN MOTOR CO. LTD.
NORTHFIELD, BIRMINGHAM

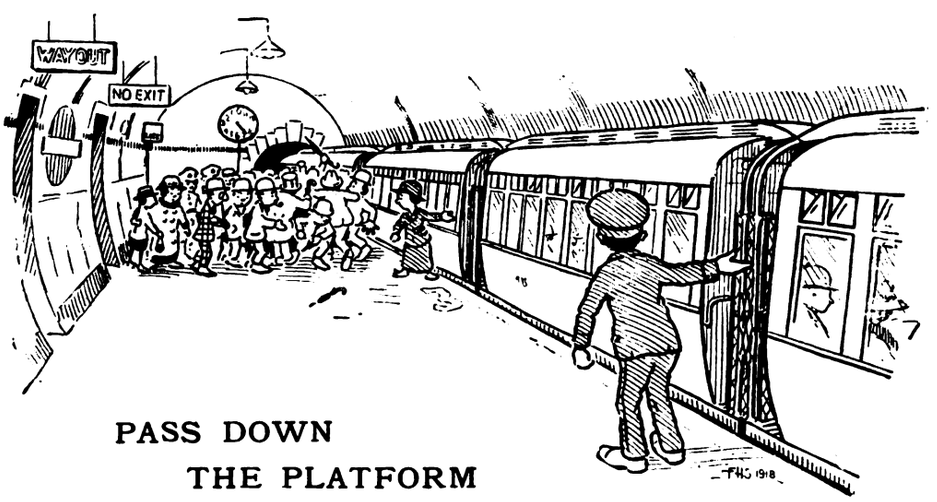
12,000 MILES
SOLID TYRE GUARANTEE

Important Notice to Users

The **Macintosh & Challiner Solid Tyres** having established such a unique record for accomplishing a mileage in excess of the guaranteed 10,000 miles, it has been decided **to guarantee Macintosh and Challiner Solid Tyres, supplied on and after 1st January 1919, for 12,000 miles,** subject to the usual Guarantee conditions.

Have you specified Macintosh or Challiner Tyres are to be fitted to your next vehicle? If not, may we suggest you do so AT ONCE and secure the benefit of our

12,000 MILES GUARANTEE



PASS DOWN
THE PLATFORM

There are four, five, or six cars to a train. There are two gates to a car, and sometimes three. Two passengers cannot get through the same gate at the same time, but they can get through different gates at the same time. Even loading means quicker loading and in comfort.

UNDERGROUND

ELECTRIC RAILWAY HOUSE,
BROADWAY, WESTMINSTER, S.W.1.

Digitized by Google

ALL TYPES OF TRAMWAY POINTS

Moveable type, fitted with "Titan" Patent Spring Mechanism
"TITAN" TRACKWORK Co. Ld.
S. OSBORN & Co. Ld., SHEFFIELD. TITAN
TITAN TRACKWORK Co. LTD SHEFFIELD
Open Type

Made of
"TITAN"
MANGANESE STEEL

TITAN TRACKWORK CO.

Rutland Works, Rutland Road, SHEFFIELD LTD.

Early delivery of ALBIONS!

MANUFACTURERS and merchants can now secure early delivery of ALBIONS, the Commercial Vehicle of proved Reliability, Economy in Up-keep and Length of Life.

Definite delivery dates can be given for the following models: 30 cwt., 50 cwt., 60 cwt., and 80 cwt. load capacity.

Since supplies of material are limited, the Albion Company, in spite of its vast resources, will only be able to supply a limited number of Vehicles. Intending purchasers are therefore strongly urged to place their orders without delay, as it will be a case of "first come first served."

ALBIONS are built by the Largest Manufacturers of Motor Vans in Great Britain

Order your Albion now!

25 cwt. Albion

ALBION

COMMERCIAL MOTORS

ALBION MOTOR CAR CO. LTD.
SCOTSTOUN, GLASGOW

Glasgow Office—105, ST. VINCENT STREET
Manchester—283, DEANSGATE Sheffield—CAMPO LANE

London Office and Repair Depot
21-22 Upper Rathbone Place, Oxford Street W.1

Digitized by Google

MICA

AND ALL **Electrical Insulating Materials**

ATTWATER & SONS

Contractors to Admiralty & War Office

PRESTON, ENGLAND

TROLLEY WIRE

Round, Grooved, Fig. 8

COPPER, SILICON & PHOSPHOR BRONZE :: COPPER & BRASS RODS, COPPER-CLAD STEEL-WIRE CABLES, &c.

Standard Underground Cable Co.

DOCK HOUSE, BILLITER ST., LONDON, E.C.

ESTABLISHED 1833

WAYGOOD-OTIS, LTD.

Lift Makers — To H.M. The King.

By Appointment

WAYGOOD-OTIS LIFTS

of all kinds and for all purposes.

FALMOUTH ROAD, LONDON, S.E.1

BINDING CASES

For half-yearly volumes of "The Tramway and Railway World" can be obtained from the Publishers, price **3s.**

READING CASES

To hold 26 Saturday Issues can be supplied at **3s. 6d.**

These Cases are strongly bound and form a convenient means for filing copies for reference until the half-yearly volumes are completed.

BUYER'S GUIDE

The names of Advertisers whose announcements appear in consecutive issues of THE TRAMWAY AND RAILWAY WORLD are inserted free of charge, **under such headings as may be desired.**

ADVERTISING, TRAMWAY AND RAILWAY.
J. W. Courtenay, Ltd., London.

AIR BRAKES. (See Brakes.)

ALUMINIUM.
Gabriel & Co., Birmingham.
Wiseman, Alfred, Ltd., Birmingham.

AMMETERS. (See Voltmeters.)

ANGLE IRON BUFFERS.
Brill Company, J. G., London, S.W.

ANTI-FRICTION METAL.
Fleming, Birkby & Goodall, Ltd., Liversedge.
Hoyt Metal Co., Ltd., London, E.C.

AUTOMATIC BRAKE ADJUSTERS. (See Brake Adjusters.)

AXLE BOXES.
Anger Manufacturing Co., Ltd., Preston.
Brill Company, J. G., London, E.C.

AXLES AND TYRES.
Anger Manufacturing Co., Ltd., Preston.
Baker, John, & Co., Rotherham.
Electro-Mechanical Brake Co., W. Bromwich.
Equipment & Engineering Co., London, W.C.

BATTERIES, STORAGE. (See Accumulators.)

BEARINGS.
Brill Company, J. G., London, E.C.
Britannia Lamp & Accessories Co., Ltd., E.C.
Hoyt Metal Co. of Great Britain, Ltd., W.6.
Hurst, Nelson & Co., Ltd., Motherwell.
Tramway Supplies, Ltd., Leeds.

BELLS AND GONGS.
Brill Company, J. G., London, E.C.
Britannia Lamp & Accessories Co., Ltd., E.C.
Equipment & Engineering Co., London, W.C.
Fleming, Birkby & Goodall, Ltd., Liversedge.
Gabriel & Co., Birmingham.
General Seating Co., Ltd., London, E.C.
Hurst, Nelson & Co., Ltd., Motherwell.
Tramway Supplies, Ltd., Leeds.

BLINDS AND CURTAINS.
Anger Manufacturing Co., Ltd., Preston.
Beckett, Laycock & Watkinson, Ltd., London.
Brill Company, J. G., London, E.C.
Equipment & Engineering Co., London, W.C.
General Seating Co., Ltd., London, E.C.

BOILERS.
Babcock & Wilcox, Ltd., London, E.C.

BOLTS.
Allen, Edgar & Co., Ltd., Sheffield.
Brockhouse, J., & Co., Ltd., West Bromwich.
Hadfields, Ltd., Sheffield.
"The Coventry" Chain Co., Coventry.
Titan Trackwork Co., Ltd., Nottingham.

BOXES, JOURNAL.
Anger Manufacturing Co., Ltd., Preston.
Brill Company, J. G., London, E.C.
Britannia Lamp & Accessories Co., Ltd., E.C.
Hurst, Nelson & Co., Ltd., Motherwell.

BRACKETS AND CROSS ARMS. (See Poles.)

BRAKES, CAR.
Brill Company, J. G., London, E.C.
British Thomson-Houston Co., Ltd., Rugby.
British Westinghouse Electric Co.
Dick, Kerr, & Co., Ltd., London, E.C.
Electro-Mechanical Brake Co., W. Bromwich.
Hurst, Nelson & Co., Ltd., Motherwell.
Tramway Supplies, Ltd., Leeds.

BRAKE HANDLES.
Brill Company, J. G., London, E.C.
Equipment & Engineering Co., London, W.C.
Fleming, Birkby & Goodall, Ltd., Liversedge
Hurst, Nelson & Co., Ltd., Motherwell.
Tramway Supplies, Ltd., Leeds.
United Electric Car Co., Ltd., Preston.

BRAKE SHOES.
Anger Manufacturing Co., Ltd., Preston.
Brill Company, J. G., London, E.C.
Electro-Mechanical Brake Co., W. Bromwich.
Equipment & Engineering Co., London, W.C.
Hadfields, Ltd., Sheffield.
Hurst, Nelson & Co., Ltd., Motherwell.
Tramway Supplies, Ltd., Leeds.
Tyne Metal Co., Ltd., Hexham-on-Tyne.
United Electric Car Co., Ltd., Preston.

BROOMS, TRACK.
Britannia Lamp & Accessories Co., Ltd., E.C.
Brush Elec. Engineering Co., Ltd.
Hurst, Nelson & Co., Ltd., Motherwell

BRUSHES, DYNAMO AND MOTOR.
Britannia Lamp & Accessories Co., Ltd., E.C.
British Westinghouse Co., Ltd., London.

CABLES, ELECTRIC TRAMWAY AND LIGHTING.
British Aluminium Co., Ltd., London, E.C.
British Westinghouse Co., Ltd., London.
Henley's Telegraph Works Co. Ltd., London.
Johnson & Phillips, Ltd., Charlton, S.E.
Macintosh & Co., Ltd., Chas., London, E.C.

CABLE PULLEYS.
Tyne Metal Co., Ltd., Hexham-on-Tyne.

CABLE TRAMWAYS.
Dick, Kerr & Co., Ltd., London, E.C.

CARBON BRUSHES. (See Dynamo & Motor Brushes.)

CARBURETTORS.
Green, Geo. W., & Co., Ltd., Feltham.

CAR CURTAINS.
Anger Manufacturing Co., Ltd., Preston.
Beckett, Laycock & Watkinson, Ltd., London.
Brill Company, J. G., London, E.C.
Equipment & Engineering Co., London, W.C.
General Seating Co., Ltd., London, E.C.

CAR JACKS.
Anger Manufacturing Co., Ltd., Preston.
Brill Company, J. G., London, E.C.
Britannia Lamp & Accessories Co., Ltd., E.C.
Equipment & Engineering Co., London, W.C.
Hurst, Nelson & Co., Ltd., Motherwell.
United Electric Car Co., Ltd., Preston, Lancs.

CAR ROOF COVERINGS.
Brill Company, J. G., London, E.C.
Equipment & Engineering Co., London, W.C.
Hurst, Nelson & Co., Ltd., Motherwell.
United Electric Car Co., Ltd., Preston, Lancs.

CAR SEATS.
Brill Company, J. G., London, E.C.
Equipment & Engineering Co., London, W.C.
General Seating Co., Ltd., London, E.C.
Hurst, Nelson & Co., Ltd., Motherwell.
United Electric Car Co., Ltd., Preston, Lancs.

CAR STEPS. (See Movable Car Steps.)

CAR STOVES.
Brill Company, J. G., London, E.C.

CAR TRIMMINGS.
Brill Company, J. G., London, E.C.
General Seating Co., Ltd., London, E.C.

CARS, TRAMWAY.
Brill Company, J. G., London, E.C.
Dick, Kerr & Co., Ltd., London.
Hurst, Nelson & Co., Ltd., Motherwell.
United Electric Car Co., Ltd., Preston, Lancs.

CAR TRUCKS.
Brill Company, J. G., London, E.C.
Electro-Mechanical Brake Co., W. Bromwich.
Hurst, Nelson & Co., Ltd., Motherwell
Peckham Truck and Eng. Co., London, S.W.
United Electric Car Co., Preston.

CASTINGS.
Anger Manufacturing Co., Ltd., Preston.
Allen, Edgar & Co., Ltd., Sheffield.
Gabriel & Co., Birmingham.
Hadfields, Ltd., Sheffield.
Hurst, Nelson & Co., Ltd., Motherwell.
Stewarts & Lloyds, Glasgow.
Titan Trackwork Co., Ltd., Nottingham.
Tramway Supplies, Ltd., Leeds.

CHAINS.
Anger Manufacturing Co., Ltd., Preston.
Coventry Chain Co., Ltd., Coventry.
Gabriel & Co., Birmingham.

CHARS-A-BANCS.
Commercial Cars, Ltd., Luton.
Clayton & Co. Huddersfield, Ltd., Huddersf'ld.
Leyland Motors, Ltd., Leyland Lancs.

CIRCUIT BREAKERS
Britannia Lamp & Accessories Co., Ltd., E.C.
British Thomson-Houston Co., Ltd., Rugby.
British Westinghouse Elec. & Mfg. Co., Ltd.
Tramway Supplies, Ltd., Leeds.

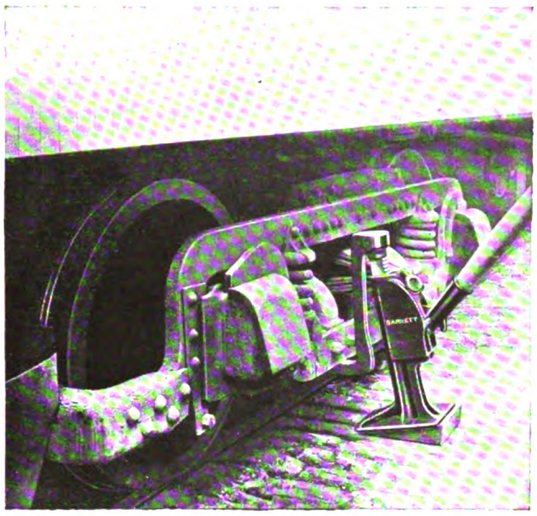
COLOURS. (See Paint.)

COMMERCIAL MOTOR VEHICLES.
Commercial Cars, Ltd., Luton.
Leyland Motors, Ltd., Leyland, Lancs.

COMMUTATORS & COMMUTATOR SEGMENTS.
Britannia Lamp & Accessories Co., Ltd., E.C.
Equipment & Engineering Co., London, W.C.
Tramway Supplies, Ltd., Leeds.

CONDENSING PLANT.
Mirrlees Watson Co., Ltd., Glasgow.

Digitized by Google



SAFETY FIRST

Secondly, see that each car is equipped with a Barrett EMERGENCY Jack.

It must be a BARRETT, which means quick lifting.

The Barrett EMERGENCY Jack illustrated lifts 15 tons (guaranteed) in any position.

Write for Full Particulars and Prices

DELIVERIES FROM STOCK

WHITE MOTORS AND ACCESSORIES, LIMITED

Concanon Works, Concanon Road, Acre Lane, Brixton

Telephones: 565 & 566 Brixton
Telegrams: Yenisean, London

LONDON, S.W.2.

Cables: Yenwalt, London

DIRECTORY OF MANUFACTURERS OF AND DEALERS IN SUPPLIES (*continued*).

CONTROLLER FINGERS.
Anger Manufacturing Co., Ltd., Preston.
Equipment & Engineering Co., London, W.C.
Tramway Supplies, Ltd., Leeds.

CONTROLLERS, ELECTRIC CAR.
British Thomson-Houston Co., Ltd., Rugby.
British Westinghouse Elec. & Mfg. Co., Ltd.
Dick, Kerr, & Co., Ltd., London.

CONVERTIBLE CARS.
Brill Company, J. G., London, E.C
Hurst, Nelson & Co., Ltd., Motherwell.

CONVEYING AND ELEVATING MACHINERY.
Allen, Edgar, & Co., Ltd., Sheffield.
Hadfields, Ltd., Sheffield.

CORED STICKS (WHITE METAL).
Hoyt Metal Co., Ltd., London, E.C.

CROSSINGS. (See Points and Crossings).

CYLINDERS.
Wiseman, Alfred, Ltd., Birmingham.

DESTINATION INDICATORS.
Anger Manufacturing Co., Ltd., Preston.
Brill Company, J. G., London, E.C.
Equipment & Engineering Co., London, W.C.
Gabriel & Co., Birmingham.
General Seating Co., Ltd., London, E.C.
Tramway Supplies, Ltd., Leeds.

DESTINATION SIGNS.
Anger Manufacturing Co., Ltd., Preston.
Brill Company, J. G., London, E.C.
Equipment & Engineering Co., London, W.C.
Gabriel & Co., Birmingham.
General Seating Co., Ltd., London, E.C.
Tramway Supplies, Ltd., Leeds.

DYNAMOS.
British Thomson-Houston Co., Ltd., Rugby.
British Westinghouse Elec. & Mfg. Co., Ltd.
Dick, Kerr & Co., Ltd., London.

ECONOMISERS.
Green, E., & Son, Ltd., Wakefield.

ELECTRIC BRAKES.
British Thomson-Houston Co., Ltd., Rugby.
British Westinghouse Electric Co., Ltd., Manchester.

ELECTRIC CABLES.
Henley's Telegraph Works Co., Ltd., London.
Johnson & Phillips, Ltd., Charlton, S.E.
Kalker, E., & Co., Coventry.
Macintosh & Co., Ltd., Chas., London, E.C.

ELECTRIC HEATERS.
Britannia Lamp & Accessories Co., Ltd., E.C.

ELECTRIC LAMPS. (See Lamps.)

ELECTRIC TRAMWAY SUPPLIES.
Allen, Edgar, & Co., Ltd., Sheffield.
Anger Manufacturing Co., Ltd., Preston.
Brill Company, J. G., London, E.C.
Britannia Lamp & Accessories Co., Ltd., E.C.
British Thomson-Houston Co., Ltd., Rugby.
British Westinghouse Co., Ltd., London.
Dick, Kerr, & Co., Ltd., London.
Equipment & Engineering Co., London, W.C.
Fleming, Birkby & Goodall, Ltd., Liversedge.
Gabriel & Co., Birmingham.
General Seating Co., Ltd., London, E.C.
Hadfields, Ltd., Sheffield.
Henley's Telegraph Works Co., Ltd., London.
Hurst, Nelson & Co., Ltd., Motherwell.
Titan Trackwork Co., Ltd., Nottingham.
Tramway Supplies, Ltd., Leeds.
United Electric Car Co., Ltd., Preston, Lancs.
Wiseman, Alfred, Ltd., Birmingham.

ELECTRICAL ACCESSORIES.
Fleming, Birkby & Goodall, Ltd., Liversedge.
Johnson & Phillips, Ltd., Charlton, S.E.
Tramway Supplies, Ltd., Leeds.

ENGINES.
Belliss & Morcom, Ltd., Birmingham.

FARE REGISTERS.
Bell Punch & Printing Co., Ltd., London.
Brill Company, J. G., London, E.C.

FENDERS, TRAMCAR.
Anger Manufacturing Co., Ltd., Preston.
Brill Company, J. G., London, E.C.
Hurst, Nelson & Co., Ltd., Motherwell.
United Electric Car Co., Ltd., Preston, Lancs.

FISHBOLTS.
Allen, Edgar, & Co., Ltd., Sheffield.

FOLDING GATES.
Brill Company, J. G., London, E.C.
Gabriel & Co., Birmingham.
Hurst, Nelson & Co., Ltd., Motherwell.

FORGINGS.
Baker, John, & Co., Rotherham.
Brill Company, J. G., London, E.C.
Brockhouse, J., & Co., Ltd., West Bromwich.
Electro-Mechanical Brake Co., W. Bromwich.
Hurst, Nelson & Co., Ltd., Motherwell.

FUEL ECONOMISERS.
Green, E., & Son, Ltd., Wakefield.

GEAR CASES.
Anger Manufacturing Co., Ltd., Preston.
British Thomson-Houston Co., Ltd., Rugby.

GEAR CASES—*continued.*
Britannia Lamp & Accessories Co., London.
Equipment & Engineering Co., London, W.C.
Peckham Truck and Eng. Co., London, S.W.
Tramway Supplies, Ltd., Leeds.

GEARS.
Anger Manufacturing Co., Ltd., Preston.
Britannia Lamp & Accessories Co., London.
British Thomson-Houston Co., Ltd., Rugby.
Electro-Mechanical Brake Co., W. Bromwich.
Fleming, Birkby & Goodall, Ltd., Liversedge.
Hadfields, Ltd., Sheffield.
Scholey and Co., Ltd., London, E.C.
Tramway Supplies, Ltd., Leeds.

GEARS AND PINIONS.
Anger Manufacturing Co., Ltd., Preston.
Britannia Lamp & Accessories Co., London.
British Thomson-Houston Co., Ltd., Rugby.
Electro-Mechanical Brake Co., W. Bromwich.
Equipment & Engineering Co., London, W.C.
Fleming, Birkby & Goodall, Ltd., Liversedge.
Tramway Supplies, Ltd., Leeds.

GEAR WHEELS.
Britannia Lamp & Accessories Co., Ltd., E.C.
Electro-Mechanical Brake Co., W. Bromwich.
Equipment & Engineering Co., London, W.C.
Fleming, Birkby & Goodall, Ltd., Liversedge.
Tramway Supplies, Ltd., Leeds.
Wiseman, Alfred, Ltd., Birmingham.

GENERATORS. (See Dynamos.)

GRINDING MACHINES.
Equipment & Engineering Co., London, W.C.

GRINDING MACHINES, CAR WHEEL.
Britannia Lamp & Accessories Co., Ltd., E.C.
Thermit, Ltd., London, E.C.

GUARD WIRE.
Anger Manufacturing Co., Ltd., Preston.
Britannia Lamp & Accessories Co., Ltd., E.C.
Equipment & Engineering Co., London, W.C.
Fleming, Birkby & Goodall, Ltd., Liversedge.
Gabriel & Co., Birmingham.
Tramway Supplies, Ltd., Leeds.

GUARDS.
Brill Company, J. G., London, E.C.
Gabriel & Co., Birmingham.
Hurst, Nelson & Co., Ltd., Motherwell.

HEADLIGHTS.
Brill Company, J. G., London, E.C.
Britannia Lamp & Accessories Co., Ltd., E.C.

Digitized by Google

Established 1837
KEARSLEY'S
TRADE MARK.
SUPERFINE
VARNISHES
AND
COLOURS
As supplied to the leading Tramways at Home and Abroad
Robert
KEARSLEY
& Co., Ltd.
RIPON, Yorks.
AND
"MORNING POST" BUILDING, 346 STRAND
LONDON W.C.2

ALUMINIUM CASTINGS
COAN CASTS CLEAN CRANK CASES
FOR ALL TRADES
2 H.P. to 600 H.P.
SAND OR DIE
CHILL CASTINGS A SPECIALITY.
Telegrams KRANKASES ISLING, LONDON
Telephones 3846 City 4879 Central
ROBERT. W. COAN
The Aluminium Foundry
219 Goswell Road London E.C.1
CONTRACTOR TO H.M. GOVERNMENT

MOTOR TRACTION
DEALING WITH MOTOR VEHICLES for BUSINESS PURPOSES
The Journal for Buyers and Users
DEALS in a practical and helpful manner with motor transport in all branches: its possibilities, its progress, and its problems.
Every Wednesday. Price Threepence.
Specimen Copy Post Free.
ILIFFE & SONS Ltd., 20, Tudor St., London, E.C.4.

DIRECTORY OF MANUFACTURERS OF AND DEALERS IN TRAMWAY AND RAILWAY SUPPLIES (*continued*).

HEATERS, ELECTRIC.
Britannia Lamp & Accessories Co., Ltd., E.C.

HYDRAULIC PRESSES.
Hadfields, Ltd., Sheffield.

IGNITION LEADS (FOR MOTOR CARS).
Henley's Telegraph Works Co., Ltd., London.
Kalker, E., & Co., Coventry.

INDICATORS. (See Destination Indicators.

INSULATING MATERIAL.
Britannia Lamp & Accessories Co., Ltd., E.C.
Equipment & Engineering Co., London, W.C.
Fleming, Birkby & Goodall, Ltd., Liversedge.
Kalker, E., & Co., Coventry.
Tramway Supplies, Ltd., Leeds.
Wiseman, Alfred, Ltd., Birmingham.

INSULATING VARNISHES.
Equipment & Engineering Co., London, W.C.
Fleming, Birkby & Goodall, Ltd., Liversedge.

INSULATORS, TRAMWAY.
Britannia Lamp & Accessories Co., Ltd., E.C.
British Thomson-Houston Co., Ltd., Rugby.
British Westinghouse Co., Ltd., London.
Equipment & Engineering Co., London, W.C.
Fleming, Birkby & Goodall, Ltd., Liversedge.
Henley's Telegraph Works Co., Ltd., London.
Tramway Supplies, Ltd., Leeds.
Wiseman, Alfred, Ltd., Birmingham.

IRONWORK FOR CAR BODIES.
Brockhouse, J., & Co., Ltd., West Bromwich

JACKS.
Anger Manufacturing Co., Ltd., Preston.
Equipment & Engineering Co., London, W.C.
White Motors and Accessories, Ltd.

JOINT BOXES.
Henley's Telegraph Works Co., Ltd., London
Johnson & Phillips, Ltd., Charlton, S.E.
Tramway Supplies, Ltd., Leeds.

JOINT PLATES.
Allen, Edgar, & Co., Ltd., Sheffield.
Hadfields, Ltd., Sheffield.

JOINTS, RAIL.
Allen, Edgar, & Co., Ltd., Sheffield.
Thermit, Limited, London, E.C.

JOURNAL BOXES.
Anger Manufacturing Co., Ltd., Preston.
Brill Company, J. G., London, S.W.
Hurst, Nelson & Co., Ltd., Motherwell.
United Electric Car Co., Ltd., Preston, Lancs.

JOURNAL BOX PACKING.
Beckett, Laycock & Watkinson, Ltd., London.
Equipment & Engineering Co., London, W.C.
General Seating Co., Ltd., London, E.C.

LAMPS, ELECTRIC.
Britannia Lamp & Accessories Co., London.
British Thomson-Houston Co., Ltd., Rugby.
British Westinghouse Elec. & Mfg. Co., Ltd.

LEATHERS (UPHOLSTERY).
General Seating Co., Ltd., London, E.C.

LIFE GUARDS.
Gabriel & Co., Birmingham.
Hurst, Nelson & Co., Ltd., Motherwell.

LIFTING JACKS.
Brill Company, J. G., London, E.C.
Equipment & Engineering Co., London, W.C.
Hurst, Nelson & Co., Ltd., Glasgow.

LIGHTNING ARRESTERS.
Britannia Lamp & Accessories Co., Ltd., E.C.
British Thomson-Houston Co., Ltd., Rugby.
British Westinghouse Elec. & Mfg. Co., Ltd
Equipment & Engineering Co., London, W.C.

LINCRUSTA WALTON.
General Seating Co., Ltd., London, E.C.

LINE MATERIAL, ELECTRIC TRAMWAY
Britannia Lamp & Accessories Co., London.
British Thomson-Houston Co., Ltd., Rugby.
Dick, Kerr, & Co., Ltd., London.
Electro-Mechanical Brake Co., W. Bromwich.
Equipment & Engineering Co., London, W.C.
Fleming, Birkby & Goodall, Ltd., Liversedge
Green, Geo. W., & Co., Ltd., Feltham.
Henley's Telegraph Works Co., Ltd., London
Standard Underground Cable Co., London.
Tramway Supplies, Ltd., Leeds.
Wiseman, Alfred, Ltd., Birmingham.

LOCK NUTS.
Vislok Ltd., London, E.C.

LOCK WASHERS.
Britannia Lamp & Accessories Co., Ltd., E.C.
Equipment & Engineering Co., London, W.C.

LOCOMOTIVES.
British Thomson-Houston Co., Ltd., Rugby.
British Westinghouse Co., Ltd., London.
Dick, Kerr, & Co., Ltd., London, E.C.
Hurst, Nelson & Co., Ltd., Motherwell.

LORRIES.
Clayton & Co. Huddersfield, Ltd., Huddersf'ld.
Commercial Cars, Ltd., Luton.
Leyland Motors, Ltd., Leyland, Lancs.

METALS
Gabriel & Co., Birmingham.
Hoyt Metal Co., Ltd., London, E.C.
Magnolia Anti-Friction Metal Co. of Great Britain, Ltd., London, E.C.

MILLBOARDS—"PANELLIUM."
General Seating Co., Ltd., London, E.C.

MOTOR OMNIBUSES.
Clayton & Co. Huddersfield, Ltd., Huddersf'ld.
Commercial Cars, Ltd., Luton.
Leyland Motors, Ltd., Leyland, Lancs.

MOTOR OMNIBUS FITTINGS.
Gabriel & Co., Birmingham.

MOTOR TRUCKS (See Trucks).

MOTOR VANS.
Clayton & Co Huddersfield, Ltd., Huddersf'ld.
Commercial Cars, Ltd., Luton.
Leyland Motors, Ltd., Leyland, Lancs.

MOTOR VEHICLES.
Clayton & Co Huddersfield, Ltd., Huddersf'ld.
Commercial Cars, Ltd., Luton.
Leyland Motors, Ltd., Leyland, Lancs.

MOVABLE CAR STEPS.
Anger Manufacturing Co., Ltd., Preston.
Equipment & Engineering Co., London, W.C.
Hurst, Nelson & Co., Ltd., Motherwell.

OVERHEAD EQUIPMENT. (See Line Material.)

OVERHEAD LINE TOOLS.
Britannia Lamp & Accessories Co., Ltd., E.C.

PAINT.
Docker Bros., Ltd., London.
Kearsley, Robert, & Co., Ltd., Ripon, Yorks.

PANELS, ALUMINIUM.
British Aluminium Co., Ltd., London, E.C.

PANELS, MAHOGANY, etc.
Brill Company, J. G., London, S.W.
General Seating Co., Ltd., London, E.C.

PERMANENT WAY TOOLS.
Allen, Edgar, & Co., Ltd., Sheffield.

PISTON RINGS.
Allen & Simmonds, Ltd., Reading.

POINTS AND CROSSINGS.
Allen, Edgar, & Co., Ltd., Sheffield.
Dick, Kerr, & Co., Ltd., London.
Hadfields, Ltd., Sheffield.
Lorain Steel Company, London.
Titan Trackwork Co., Ltd., Sheffield.

POINT CONTROLLERS.
Equipment & Engineering Co., London, W.C.
Tramway Supplies, Ltd., Leeds.

POLES, METAL.
Britannia Lamp & Accessories Co., E.C.
Dick, Kerr, & Co., Ltd., London.
Equipment & Engineering Co., London, W.C.
Stewarts & Lloyds, Ltd., Glasgow.
Tramway Supplies, Ltd., Leeds.

PORTABLE RAILWAYS.
Hurst, Nelson & Co., Ltd., Motherwell.

PUBLIC SERVICE VEHICLES.
Clayton & Co Huddersfield, Ltd., Huddersf'ld

PULLEYS, CABLE.
Dick, Kerr, & Co., Ltd., London.
Hadfields, Ltd., Sheffield.
Tyne Metal Co., Ltd., Hexham-on-Tyne.

PULLEYS, SHAFTING, COUPLINGS, etc.
Allen, Edgar, & Co., Ltd., Sheffield.
Hadfields, Ltd., Sheffield.

PUNCHES, TICKET.
Auto-Ticket Printing Co., Ltd., Liverpool.
Bell Punch & Printing Co., Ltd., London.
Ticket Punch & Register Co., Ltd., London.
Williamson, Alfred, Ashton-under-Lyne.

RAIL BENDERS.
Anger Manufacturing Co., Ltd., Preston.
Equipment & Engineering Co., London, W.C.
Hadfields, Ltd., Sheffield.

RAIL BONDS.
Anger Manufacturing Co., Ltd., Preston.
Britannia Lamp & Accessories Co., Ltd., E.C.
Equipment & Engineering Co., London, W.C.
Tramway Supplies, Ltd., Leeds.

RAIL CLEANERS.
Anger Manufacturing Co., Ltd., Preston.
Brill Company, J. G., London. E.C.
Britannia Lamp & Accessories Co., Ltd., E.C.
Equipment & Engineering Co., London, W.C.
Green, Geo. W., & Co., Ltd., Feltham.
Hurst, Nelson & Co., Ltd., Motherwell.

RAIL GRINDERS.
Anger Manufacturing Co., Ltd., Preston.
Equipment & Engineering Co., London, W.C.
Thermit, Ltd., London, E.C.
Tramway Supplies, Ltd., Leeds.

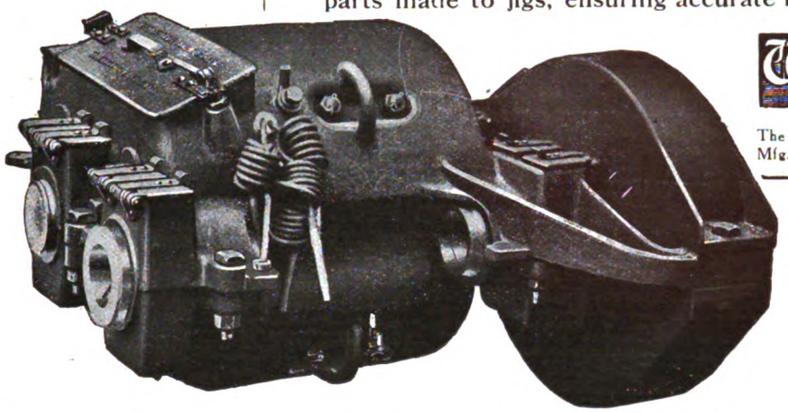
RAIL JOINTS.
Hadfields, Ltd., Sheffield.
Thermit, Limited, London, E.C.

(*Continued on page xx.*)

Digitized by Google

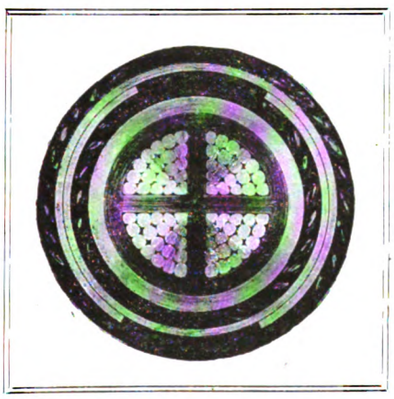
Over 4500 Westinghouse
Tramway Motors

have been supplied to the London County Council and the Glasgow Corporation. These motors are famous for their efficiency and low maintenance costs. All renewable parts made to jigs, ensuring accurate fitting of spare parts.



Westinghouse
Manchester

The British Westinghouse Electric and Mfg. Co. Ltd., Trafford Park, Manchester



·075 sq. in. Cable, Class 202, Paper Insulated, Lead Covered, Served, Steel Tape Armoured and Served.

HENLEY CABLES

EVERY year we manufacture tens of thousands of miles of small electric wire insulated with Vulcanised India Rubber, in addition to Paper insulated Mains.

WE have separate factories (at North Woolwich and Gravesend, England), each devoting its energies to one type.

YOU should ask us to quote for your requirements in *any* size or type of Electric Cables for use under any working condition.

W. T. HENLEY'S TELEGRAPH WORKS CO. LTD.
Blomfield St., LONDON, E.C.2.

Digitized by Google

DIRECTORY OF MANUFACTURERS OF AND DEALERS IN SUPPLIES (*continued*).

RAILLESS ELECTRIC SYSTEMS.
Britannia Lamp & Accessories Co., Ltd., E.C.
Tramway Supplies, Ltd., Leeds.

RAIL LIFTERS
Anger Manufacturing Co., Ltd., Preston.
Equipment & Engineering Co., London, E.C.

RAIL PLANES.
Thermit, Ltd., London, E.C.

RAILS, TURNOUTS, CURVES, etc.
Allen, Edgar, & Co., Ltd., Sheffield.
Dick, Kerr, & Co., Ltd., London.
Hadfields, Ltd., Sheffield.
Lorain Steel Company, London.
Titan Trackwork Co., Ltd., Sheffield.

RAILWAY AND TRAMWAY MOTORS, ELECTRIC.
Brill Company, J. G., London, S.W.
British Thomson-Houston Co., Ltd., Rugby.
British Westinghouse Co., Ltd., London.
Dick, Kerr, & Co., Ltd., London.

RAILWAY STORES.
Gabriel & Co., Birmingham.
General Seating Co., Ltd., London, E.C.
Hurst, Nelson & Co., Ltd., Motherwell.

RATTAN.
Anger Manufacturing Co., Ltd., Preston.
Brill Company, J. G., London, E.C.
General Seating Co., Ltd., London, E.C.

RESISTANCES.
Electro-Mechanical Brake Co., W. Bromwich.

ROLLER BEARINGS.
Hurst, Nelson & Co., Ltd., Motherwell.

SANDING DEVICES.
Equipment & Engineering Co., London, W.C.
Gabriel & Co., Birmingham.
Tramway Supplies, Ltd., Leeds.

SAND BOXES.
Anger Manufacturing Co., Ltd., Preston.
Brill Company, J. G., London, S.W.
Gabriel & Co., Birmingham.
Hurst, Nelson & Co., Ltd., Motherwell.
Tramway Supplies, Ltd., Leeds.
United Electric Car Co., Ltd., Preston, Lancs.

SEATS AND SEATING MATERIALS.
Brill Company, J. G , London, E.C.
Equipment & Engineering Co., London, W.C.
General Seating Co., Ltd., London, E.C.

SIDE GUARDS.
Anger Manufacturing Co., Ltd., Preston.
Equipment & Engineering Co., London, W.C.

SIMPLEX JACKS.
Anger Manufacturing Co., Ltd., Preston.
Equipment & Engineering Co., London, W.C.

SNOW PLOWS.
Brill Company, J. G., London, S.W.
Hurst, Nelson & Co., Ltd., Motherwell.

SPRINGS.
Allen, Edgar, & Co., Ltd., Sheffield.
Anger Manufacturing Co., Ltd., Preston.
Brill Company, J. G., London, E.C
Gabriel & Co., Birmingham.
Hadfields, Ltd., Sheffield.
Hurst, Nelson & Co., Ltd., Motherwell.
Smith Bros. & Hill, Ltd., West Bromwich.

SPRINGS (LAMINATED AND SPIRAL.)
Brockhouse, J., & Co., Ltd., West Bromwich.

SPRINKLING CARS.
Brill Company, J. G., London, S.W.
Hurst, Nelson & Co., Ltd., Motherwell,
United Electric Car Co., Ltd., Preston, Lancs.

STEAM TURBINES.
British Thomson-Houston Co., Ltd., Rugby.
British Westinghouse Elec. & Mfg. Co., Ltd.
Dick, Kerr, & Co., Ltd., London.

STEAM WAGONS.
Leyland Motors, Ltd., Leyland, Lancs.

STEEL FORGINGS.
Allen, Edgar, & Co., Ltd., Sheffield.
Baker, John, & Co., Rotherham.
Brill Company, J. G., London, E.C.
Brockhouse, J., & Co., Ltd., West Bromwich.
Electro-Mechanical Brake Co., W. Bromwich.
Hadfields, Ltd., Sheffield.

STEEL STRUCTURAL WORK.
Allen, Edgar, & Co., Ltd., Sheffield.

STEPS. (See Movable Car Steps.)

STONEBREAKERS.
Allen, Edgar, & Co., Ltd., Sheffield.
Hadfields, Ltd., Sheffield.

STRAIN WIRE
Anger Manufacturing Co., Ltd., Preston.
Britannia Lamp & Accessories Co., Ltd., E.C.
Equipment & Engineering Co., London, W.C.
Fleming, Birkby & Goodall, Ltd., Liversedge.
Tramway Supplies, Ltd., Leeds.

SWEEPERS.
Brill Company, J. G., London, S.W.
Hurst, Nelson & Co., Ltd., Motherwell.

SWITCHBOARDS AND GEAR.
British Thomson-Houston Co., Rugby.
British Westinghouse Co., London.
Edison Swan Electric Co., Ltd., Ponders End, Middlesex.
Johnson & Phillips, Ltd., Charlton, S.E.
Tramway Supplies, Ltd., Leeds.

SWITCHES, ELECTRICAL.
British Thomson-Houston Co., Ltd., Rugby.
Edison Swan Electric Co., Ltd., Ponders End, Middlesex.
Johnson & Phillips, Ltd., Charlton, S.E.
Tramway Supplies, Ltd., Leeds.

THIRD-RAIL INSULATORS.
Britannia Lamp & Accessories Co., Ltd., E.C.
Fleming, Birkby & Goodall, Ltd., Liversedge.
Wiseman, Alfred, Ltd., Birmingham.

THREE-PLY VENEER.
Equipment & Engineering Co., London, W.C.

TICKET PUNCHES. (See Punches).

TIME INDICATORS.
General Seating Co., Ltd., London, E.C.

TIRES.
Allen, Edgar, & Co., Ltd., Sheffield.
Baker, John, & Co., Rotherham.
Equipment & Engineering Co., London, W.C.
Hadfields, Ltd., Sheffield.
Macintosh & Co., Ltd., Chas., London, E.C.

TOWER WAGONS.
Britannia Lamp & Accessories Co., Ltd., E.C.
Clayton & Co. Huddersfield, Ltd., Huddersf'ld.
Commercial Cars, Ltd., Luton.
Equipment & Engineering Co., London, W.C.

TOWER WAGONS—*continued.*
Leyland Motors, Ltd., Leyland, Lancs.
Tramway Supplies, Ltd., Leeds.

TRACK BRAKES.
Anger Manufacturing Co., Ltd., Preston.
Brill Company, J. G., London, S.W.
Electro-Mechanical Brake Co., W. Bromwich.
Equipment & Engineering Co., London, W.C.
Hurst, Nelson & Co., Ltd., Motherwell.
Tramway Supplies, Ltd., Leeds.

TRACK SANDERS.
Anger Manufacturing Co., Ltd., Preston.
Brill Company, J. G., London, S.W.
Gabriel & Co., Birmingham.
Hurst, Nelson & Co., Ltd., Motherwell.
Tramway Supplies, Ltd., Leeds.

TRACK TOOLS AND APPLIANCES.
Allen, Edgar, & Co., Ltd., Sheffield.
Britannia Lamp & Accessories Co., Ltd., E.C.
Green, Geo. W., & Co., Ltd., Feltham.

TRAMWAY FOUNDATIONS.
British Reinforced Concrete Engineering Co., Ltd., Manchester.

TROLLEY CORD.
Britannia Lamp & Accessories Co., Ltd., E.C.
Equipment & Engineering Co., London, W.C.

TROLLEY HANGERS.
Anger Manufacturing Co., Ltd., Preston.
Britannia Lamp & Accessories Co., Ltd., E.C.
British Westinghouse Co., Ltd., London.
Equipment & Engineering Co., London, W.C.
Fleming, Birkby & Goodall, Ltd., Liversedge.
Tramway Supplies, Ltd., Leeds.
Wiseman, Altred, Ltd., Birmingham.

TROLLEY SPINDLES.
Fleming, Birkby & Goodall, Ltd., Liversedge.
Tramway Supplies, Ltd., Leeds.
Wiseman, Altred, Ltd., Birmingham.

TROLLEY STANDARD EARTHING DEVICE.
Britannia Lamp & Accessories Co., Ltd., E.C.

TROLLEY TENSION INDICATOR.
Britannia Lamp & Accessories Co., Ltd., E.C.

TROLLEY WHEELS AND HEADS.
Anger Manufacturing Co., Ltd., Preston.
Britannia Lamp & Accessories Co., Ltd., E.C.
British Aluminium Co., Ltd., London, E.C.
British Thomson-Houston Co., Ltd., Rugby.
Electro-Mechanical Brake Co., W. Bromwich.
Fleming, Birkby & Goodall, Ltd., Liversedge.
Gabriel & Co., Birmingham.
Tramway Supplies, Ltd., Leeds.
Wiseman, Alfred, Ltd., Birmingham.

TROLLEY WIRE.
Anger Manufacturing Co., Ltd., Preston.
Britannia Lamp & Accessories Co., Ltd., E.C.
Equipment & Engineering Co., London, W.C.
Frederick Smith & Co., Salford, Manchester.
Standard Underground Cable Co., London.
Tramway Supplies, Ltd., Leeds.

TRUCK BRAKES.
Anger Manufacturing Co., Ltd., Preston.
Brill Company, J. G., London, E.C.
Peckham Truck & Eng. Co., London, S.W.
Tramway Supplies, Ltd., Leeds.

TRUCKS, CAR.
Brill Company, J. G., London, S.W.
Dick, Kerr, & Co., Ltd., London.
Electro-Mechanical Brake Co., W. Bromwich.
Hurst, Nelson & Co., Ltd., Motherwell.
Lorain Steel Company, London.

VARNISHES.
Docker Bros., Ltd., London.
Fleming, Birkby & Goodall, Ltd., Liversedge.
Pinchin, Johnson, & Co., Ltd., London, E.C.

WASHERS.
Smith Bros. & Hill, Ltd., West Bromwich.

WELDED JOINTS.
Thermit, Limited, London, E.C.

WHEELS AND AXLES.
Allen, Edgar, & Co., Ltd., Sheffield.
Baker, John, & Co., Rotherham.
Brill Company, J. G., London, S.W.
British Griffin Co., Ltd., London.
Equipment & Engineering Co., London, W.C.
Hadfields, Ltd., Sheffield.
Hurst, Nelson & Co., Ltd., Motherwell.

WHEELS WITH WROT IRON CENTRES.
Anger Manufacturing Co., Ltd., Preston.
Baker, John, & Co., Rotherham.
Hurst, Nelson & Co., Ltd., Motherwell.

WHITE METAL FOR BEARINGS.
Hoyt Metal Co., Ltd., London, E.C.

WIRE, COPPER.
Britannia Lamp & Accessories Co., Ltd., E.C.
Henley's Telegraph Works Co., Ltd., London.
Smith, Frederick, & Co., Salford, Manchester.
Standard Underground Cable Co., London.

WIRE ROPES.
Britannia Lamp & Accessories Co., Ltd., E.C.

BECLAWAT

Elastic Axle Journal Packing

A MIXTURE OF THE BEST WOOL
AND HORSEHAIR FOR LUBRICATING
TRAMCAR AXLE-BOXES

Will save you 25% on your Oil Bill

Write for Prices and Samples to

BECKETT, LAYCOCK & WATKINSON Ltd.

Patentees and Manufacturers

—AGENTS ALL—
OVER THE WORLD

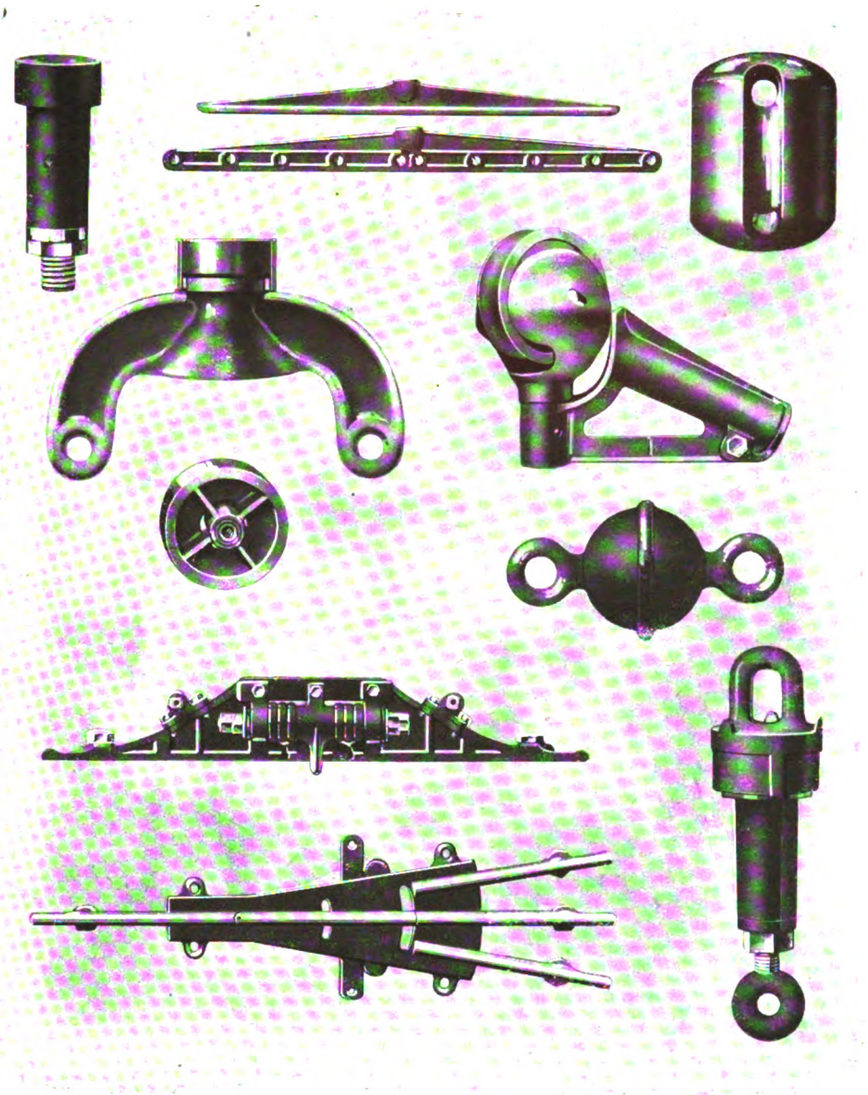
Willesden Junction, LONDON N.W.

Tel. No. 1558 Willesden

Tel. Add. "BECLAWAT"

Digitized by Google

BIRKBY'S
TRAMWAY & ELECTRICAL
MATERIAL



Every Description of Overhead Line Fitting
for Round, Grooved, Fig. 8 or any other Section of Wire and
All Classes of Insulating Materials

FLEMING, BIRKBY & GOODALL LTD
LIVERSEDGE——————YORKS

Digitized by Google

AFTER

working for about three years on War orders

JOHN BAKER & CO.

(ROTHERHAM) LTD.

are about to resume the manufacture of

TYRES, AXLES & WHEELS

FOR

Electric Tramways

BRINSWORTH IRON WORKS
ROTHERHAM and
KILNHURST STEEL WORKS
near ROTHERHAM

PEASE & PARTNERS LTD.

WORKS

TEES IRONWORKS, MIDDLESBRO'

LICENSEES

OF THE

STEEL BACK

BRAKE BLOCK

FOR

RAILWAYS AND TRAMWAYS

SOLE ENGLISH AGENTS

ALFRED INGRAM & CO.

Queen Annes Chambers
Westminster

Digitized by Google

DIRECTORIES OF ELECTRIC TRAMWAYS

IN THE UNITED KINGDOM

NAMES OF PRINCIPAL OFFICERS

POSTAL ADDRESS, TELEGRAPHIC ADDRESS, AND TELEPHONE NUMBERS

MUNICIPAL TRAMWAYS, pp. xxiii-xxiv. **COMPANY TRAMWAYS, pp. xxiv-xxvi.**

TRAMWAYS (BOARD OF TRADE) COMMITTEE AND AREA SUB-COMMITTEES, p. xxvi.

***** For Particulars of Track and Equipment, Reference should be made to pages xxvii-xxx, March 14, 1918.**

Aberdare Urban District Tramways, Gadlys Estate, Aberdare. [T.A., Tramways, Aberdare: T.N., 17.] *Gen. Manager and Elec. Engineer*, A. J. Abraham; *Traffic Supt.*, H. King; *Chairman Try. Com.*, Coun. E. Stonelake.

Aberdeen Corporation Tramways, Municipal Buildings, Union Street, Aberdeen. [T.A., Trams, Aberdeen; T.N. 826.] *Gen. Manager and Eng.*, W. Forbes; *Per. Way Eng.*, J. Gordon (*Burgh Surveyor*); *Chairman Try. Com.*, Dean of Guild Meff.

Accrington Corporation Tramways, Market Hall, Accrington. [T.A., Trams, Accrington; T.N., 2212.] *Gen. Manager and Eng.*, H. Pilling; *Per. Way Eng.*, W. J. Newton; *Chairman Try. Com.*, Ald. T. E. Higham; *Vice-Chairman*, Coun. Morley.

Ashton-under-Lyne Corporation Tramways, Tramway Depot, Mossley Road, Ashton. [T.A., Tramways, Ashton; T.N., 325.] *Gen. Manager*, Ernest Holt; *Elec. Eng.*, N. Appelbee; *Chairman Try. Com.*, Ald. R. S. Oldham; *Vice-Chairman*, Ald. Waterhouse.

Ayr Corporation Tramways, Town Building, Ayr. [T.A., Trams, Ayr; T.N., 123.] *Gen. Manager and Eng.*, William Grant; *Burgh Elec. Eng.*, R. Marshall; *Per. Way Eng.*, John Young; *Rolling Stock Supt.*, Alf. Somerville; *Convener Try. Com.*, Coun. J. R. Learmont; *Vice-Chairman*, Bailie T. Murray.

Bacup Corporation Tramways.—Town Hall, Bacup, Lancs. [Lines leased to and worked by Rawtenstall Corporation.] *Town Clerk*, J. Entwistle; *Boro' Eng.*, G. Bradley; *Chairman Try. Com.*, Ald. Sir J. H. Maden; *Vice-Chairman*, Coun. J. H. Lord.

Barking Town Urban District Tramways, East Street, Barking. [T.N., 156 East Ham.] *Eng. and Manager*, W. Holmes; *Acting Engineer and Manager*, W. E. Kidner; *Chairman Try. Com.*, Coun. J. Ranson.

Barton-upon-Irwell District Council Light Railways, Barton-upon-Irwell.

[Line leased to and worked by the Lancashire United Tramways Co., *q.v.*]

Batley Corporation Tramways, Batley, Yorks. *Engineer*, S. D. Jones; *Chairman Try. Com.*, Coun. F. W. H. Auty; *Vice-Chairman*, Coun. J. E. Oldroyd.

[Lines leased to and worked by the Yorkshire (Woollen District) Electric Tramways, Ltd., *q.v.*]

Belfast City Tramways, Tramways Office, Sandy Row, Belfast. [T.A., Tramways, Belfast; T.N., 2444.] *Gen. Manager*, J. S. D. Moffet; *Traffic Manager*, R. McMaster; *City Elec. Eng.*, T. W. Bloxam; *Per. Way Eng.*, E. S. Pinkerton; *Chief Eng.*, ——————; *Chairman Try. Com.*, Coun. W. C. Turner; *Vice-Chairman*, Coun. J. McDonald.

Bexley Urban District Council Tramways and Dartford Light Railways, Broadway, Bexleyheath, Kent. [T.A., Stokes, Tramways, Bexley; T.N., 79.] *Gen. Manager and Elec. Eng.*, H. P Stokes; *Chief Assist.*, J. Makin; *Chairman Try. Com.*, Coun. G. Sheldon.

Birkenhead Corporation Tramways, Laird Street, Birkenhead. [T.A., Tramways Manager, Birkenhead; T.N., 1110.] *Gen. Manager*, C. Clarke; *Borough Sur. and Eng.*, C. Brownridge; *Rolling Stock Supt.*, R. Chadwick; *Chairman Try. Com.*, Coun. H. Halsall; *Vice-Chairman*, Coun. R. Frame.

Birmingham Corporation Tramways, The Council House, Congreve Street, Birmingham. [T.A., Trams, Birmingham; T.N., Central 7,000.] *Gen. Manager*, A. Baker; *City Elec. Eng.*, R. A. Chattock; *Traffic Supt.*, J. McDonnell; *Per. Way Eng.*, C. E. S. Bill; *Chief Engineer*, R. H. Dickinson; *Car Works Supt.*, T. C. Winfield; *Chairman Try. Com.*, Coun. Lee.

Blackburn Corporation Tramways, Tramways Office, Blackburn. [T.A., Tramways, Blackburn: T.N., 4321.] *General Manager*, J. H. Cowell; *Elec. Eng.*, P. P. Wheelwright; *Traffic Manager*, E. Greek; *Car Shed Supt*, H. W. Seymour; *Chairman Try. Com.*, Ald. W. Thompson; *Vice-Chairman*, Coun. C. Higham.

Blackpool Corporation Tramways, West Caroline Street, Blackpool. [T.N, 67.] *Gen. Manager*, C. Furness; *Traffic Supt.*, C. I. Baker; *Resident Eng.*, F. Field; *Chairman Try. Com.*, Coun. R. Holt, J.P.; *Vice-Chairman*, Coun. H. Brooks.

Bolton Corporation Tramways, Bradshawgate, Bolton. [T.A., Manager, Tramways, Bolton; T.N., 490.] *General Manager*, J. Barnard; *Elec. Eng.*, W. J. H. Wood; *Per. Way Eng.*, E. Ll. Morgan; *Rolling Stock Supt.*, C. Beech; *Chairman Try. Com.*, Coun. P. Higson; *Vice-Chairman*, Coun. J. R. Horrocks.

Bootle Corporation Tramways, Electricity Works, Pine Grove, Bootle. [T.N., 424.] *Elec. Eng.*, T. D. Clothier; *Chairman Try. Com.*, Ald. Booth; *Vice-Chairman*, Coun. Pennington.

[Lines worked by Liverpool Corporation Tramways.]

Bournemouth Corporation Tramways, Tramways Offices, Lansdowne Crescent, Bournemouth [T.A., Tramways, Bournemouth; T.N., 1701.] *General Manager*, I. Bulfin; *Chief Assistant & Elec. Eng.*, H. Vickers; *Traffic Supt.*, G. F. Glass; *Chairman Try. Com.*, Coun. Bell; *Vice-Chairman*, Coun. McCabe.

Bradford Corporation Tramways, Central Office, 7, Hall Ings, Bradford. [T.A., Tramways, Bradford; T.N., 2381 and 2382.] *Gen. Manager*, R. H. Wilkinson; *Asst. Elec. Eng.*, J. W. Dawson; *Traffic Supt.*, T. Stirk; *City Elec. Eng.*, T. Roles: *Chairman Try. Com.*, Ald. Enoch Priestley; *Vice-Chairman*, Coun. I. F. Akeroyd.

Brighton Corporation Tramways, Lewes Road, Brighton. [T.A., Tramways, Brighton; T.N., 353 P.O.] *Eng. & Manager*, William Marsh; *Traffic Supt.*, W. N. Brooks; *Rolling Stock Supt.*, W. Orchard; *Per. Way Eng.*, F. N. Hudson; *Chairman Try. Com.*, Coun. T. J. Braybon.

Burnley Corporation Tramways, Queen's Gate, Burnley. [T.N., 46.] *Gen. Manager*, Henry Mozley; *Boro. Elec. Eng.*, J. E. Starkie; *Boro. Surveyor*, G. H. Pickles; *Chairman Try. Com.*, Coun. E. Heap; *Vice-Chairman*, Coun. Irving.

Burton-on-Trent Corporation Tramways, Guild Street, Burton-on-Trent. [T.N., 202.] *Manager*, A. B. Slater; *Engineer*, T. Hall; *Chairman Try. Com.*, Ald. J. S. Rowland; *Vice-Chairman*, Ald. Lowe.

Bury Corporation Tramways, Market Place, Bury. [T.N., 26.] *Gen. Manager*, William Clough; *Boro. Elec. Eng.*, S. J. Watson; *Chairman Try. Com.*, Ald. T. S. Collinge; *Vice-Chairman*, Coun. Hargreaves.

Cardiff Corporation Tramways, Central Offices, The Hayes, Cardiff. [T.A., Tramways, Cardiff; T.N., 1211, 1240, 1350, and 377.] *Gen. Manager and Elec. Eng.*, A. Ellis; *Deputy Manager*, C. G. M. New; *Traffic Manager*, H. David; *Rolling Stock Supt.*, Jas. Preston; permanent way under supervision of *City Engineer*, E. J. Elford; *Chairman Try. Com.*, Ald. Sir J. W. Courtis, J.P.; *Vice-Chairman*, Ald. R. J. Smith.

Chester Corporation Tramways, Station Road, Chester. [T.N., 166.] *Manager*, W. H. Ellis; *Elec. Eng.*, S. E. Britton; *Per. Way Eng.*, W. M. Jones; *Chairman Try. Com.*, Ald. J. Jones; *Vice-Chairman*, Coun. A. S. Dutton.

Chesterfield Corporation Tramways, Chatsworth Road, Chesterfield. [T.A., Tramways, Chesterfield; T.N., 78.] *Gen. Manager and Elec. Eng.*, R. L. Acland; *Traffic Manager*, F. Root; *Chairman Try. Com.*, Ald. E. Shentall (Mayor); *Vice-Chairman*, Coun. Woodhead.

Colchester Corporation Tramways, Magdalen Street, Colchester. [T.A., Tramways, Colchester; T.N., 92.] *Gen. Manager and Engineer*, R. C. Bullough; *Chairman Try. Com.*, Coun. A. M. Jarmin (Deputy Mayor); *Vice-Chairman*, Coun. G. F. Wright (Mayor).

Colne Corporation Tramways, Colne, Lancashire. *General Manager and Engineer*, T. G. Richardson; *Chairman Try. Com.*, Coun. R. Knight.

Coventry Corporation Tramways, Priestley's Bridge, Coventry. [T.A., Tramways, Coventry; T.N., 1014.] *Engineer and General Manager*, T. R. Whitehead; *Assistant Engineer*, W. M. Milnes; *Chairman*, Coun. H. W. Wale; *Vice-Chairman*, Coun. J. Grant.

Croydon Corporation Tramways, Tramways Office, Thornton Heath, Surrey. [T.A., Tramways, Croydon; T.N., 406, Croydon.] *Tramways Manager*, T. B. Goodyer; *Chairman Try. Com.*, Coun. A. A. Thomson; *Vice-Chairman*, Ald. G. J. Allen, J.P.

Darlington Corporation Tramways, Haughton Road, Darlington. [T.A., Tramways, Darlington; T.N., 2435.] *General Manager and Elec. Eng.*, J. R. P. Lunn; *Traffic Supt.*, J. Fraser; *Chairman Try. Com.*, Ald. Sir C. W. Starmer.

Dartford Urban District Council Light Railways, Dartford. *Chairman Try. Com.*, Coun. R. Bennett; *Vice-Chairman*, Coun. W. J. Bourne.

[Lines worked by Bexley U.D. Council. *q.v.*]

Darwen Corporation Tramways, Lorne Street, Darwen. [T.N., 104.] *Gen. Manager and Eng.*, G. A. Newsome; *Boro. Elec. Eng.*, ——————; *Chairman Try. Com.*, Coun. Geo. Pickup; *Vice-Chairman*, Coun. Butterworth.

Derby Corporation Tramways, 4, Victoria Street, Derby. [T.N, 410.] *Gen. Manager*, F. Harding; *Elec. Eng.*, T. P. Wilmshurst; *Per. Way Eng.*, J. Ward; *Chairman Try. Com.*, Coun. W. Eaton, J.P.

Doncaster Corporation Tramways, Grey Friar's Road, Doncaster. [T A., Rayner, Doncaster, T.N., 43.] *Boro. Elec. Eng. and Manager*, E. S Rayner; *Chairman Try. Com.*, Coun. S. Balmforth; *Vice-Chairman*, Coun. T. Bramworth.

Dover Corporation Tramways, Town Hall, Dover. [T.A., Trams, Dover; T.N., 294.] *Gen. Manager*, E. H. Bond; *Per. Way Eng.*, W C. Hawke (Boro. Surveyor); *Chairman Try. Com.*, Coun. Barwick; *Vice-Chairman*, Coun. Norman.

Dundee Corporation Tramways, Town House Buildings, Dundee. [T.N., 1340]; *Gen. Manager and Eng.*, Peter Fisher; *Elec. Eng.*, H. Richardson; *City Eng.*, J. Thomson; *Chairman Try. Com.*, G. A. Johnston.

East Ham Corporation Tramways, Nelson Street, East Ham. [T.N., 611 and 100, East Ham.] *Gen. Manager and Elec. Eng.*, W C. Ullmann; *Chairman Try. Com.*, Ald. M. Oakes J.P.

Eccles Corporation Tramways, Eccles. *Elec. Eng.*, H. W. Angus; *Per. Way Eng.*, T. S. Picton; *Chairman Try. Com.*, Coun. Alexander; *Vice-Chairman*, Ald. Pearson.

[Lines worked by Salford Corporation.]

Edinburgh Corporation Tramways, City Chambers, Edinburgh. *Gen. Manager*, R. S. Pilcher; *Burgh Engineer*, A H. Campbell; *Chairman Try. Com.*, Coun. J. Harrison.

[Edinburgh tramways are owned by the Corporation, but are at present worked by cable traction, and are leased until June, 1919, to the Edinburgh and District Tramways Company, Ltd.]

Erith Urban District Council Tramways, Tramway Depôt, Walnut Tree Road, Erith. [T.A., Tramways, Erith; T.N., 36.] *Gen. Manager and Elec. Engineer*, J. C. Williams; *Chairman Try. Com.*, Coun. G. C. Humphreys.

Exeter Corporation Tramways, Heavitree Street Exeter. *Gen. Manager*, R. O. Baldwin; *Elec. Eng.* H. D. Munro; *Per. Way Eng.*, T. Moulding; *Chairman Try. Com.*, Ald. H. B. Varwell; *Vice-Chairman*, Coun. F. G. Towill.

Farnworth Urban District Council Tramways, Albert Road, Farnworth. *Chairman Try. Com.*, Coun. R. H. Cunliffe, J.P.; *Vice-Chairman*, Coun. Stanley.

[Lines leased to the South Lancashire Tramways Co.]

Glasgow Corporation Tramways, 46, Bath Street, Glasgow. [T.A., Trams, Glasgow; T.N., 1040, Douglas.] *Gen. Manager*, J. Dalrymple; *Deputy Gen. Manager*, L. Mackinnon; *Chief Eng.*, J. Ferguson; *Elec. Eng.*, E. T. Goslin; *Sec. and Treasurer*, J. N. Wilson; *Chairman Try. Com.*, Coun. Kelly; *Vice-Chairman*, Coun. M'Whirr.

Gloucester Corporation Light Railway, Bristol Road Depôt, Gloucester. [T.A., Tramways, Gloucester; T.N. 155.] *Gen. Manager and Elec. Eng.*, F. H. Corson; *Chairman Try. Com.*, Coun. J. O. Roberts; *Vice-Chairman*, Coun. C. J. Ramstedt.

Great Yarmouth Corporation Tramways, Caister Road, Great Yarmouth. [T.N. 265.] *Gen. Manager*, F. L. Turner; *Elec. Eng.*, Gordon Bryant; *Per. Way. Eng.*, J. W. Cockrill (Borough Surveyor); *Chairman Try. Com.*, Coun. J. T. C. Salmon; *Vice-Chairman*, Ald. McCowan.

Halifax Corporation Tramways, Skircoat Road, Halifax. [T.N., 36 and 382.] *Traffic Manager*, Jas. D. Caird; *Try. Eng.*, J. W. Galloway; *Per. Way Eng.*, J. Lord (Boro. Eng.); *Chairman Try. Com.*, Ald. C. F. Spencer; *Vice-Chairman*, Ald. A. Fawcett.

Haslingden Corporation Tramways, John Street, Haslingden. *Gen. Manager, Elec. Eng., and Per. Way Eng.*, Barnes Kay; *Chairman Try. Com.*, Coun. Waddington; *Vice-Chairman*, Coun. Haworth.

Herne Bay Pier Tramway (owned and worked by Herne Bay U.D.C.), Herne Bay. [T.N., 22.] *Res. Manager*, P. W. Carey.

Heywood Corporation Tramways, Heywood, Lancs. [T.N., 47.] *Gen. Manager*, D. H. Davies; *Per. Way Eng.*, J. B. Nuttall; *Chairman Try. Com.*, Ald. J. Ashworth; *Vice-Chairman*, Ald. T. Popple, J.P.

Huddersfield Corporation Tramways, Northumberland Street, Huddersfield. [T.N., 698 and 398.] *Gen. Manager and Eng.*, A. A. Blackburn; *Assist. Engineer*, A. P. Quilliam; *Traffic Supt.*, T. Hartley; *Borough Eng.*, K. F. Campbell; *Chairman Try. Com.*, Coun. E. H. Sellers; *Vice-Chairman*, Coun. T. Canby.

Hull Corporation Tramways, Alfred Gelder Street, Hull. [T.N., 444, Corporation.] *Manager*, Wm. J. McCombe; *Engineer*, F. W. Bricknell (City Engineer) [T.N., 943, Corporation]; *Elec. Eng.*, J. Wilkinson [T.N., 443, Corporation]; *Chairman Try. Com.*, Coun. W. Hakes; *Vice-Chairman*, Coun. C. Raine.

Ilford Urban District Council Tramways, Ley Street, Ilford. [T.N., 684.] *Manager and Engineer*, L. E. Harvey; *Chairman Try. Com.*, Coun. O. Waters; *Vice-Chairman*, Coun. J. Lowe.

Ipswich Corporation Tramways, Constantine Road, Ipswich. [T.A., Ayton, Tramways, Ipswich; T.N., 354.] *Gen. Manager and Elec. Eng.*, Frank Ayton; *Traffic Supt.*, A. Butler; *Rolling Stock Supt.*, W. A. Fairhead; *Chairman Try. Com.*, Coun. E. C. Ransome (Mayor); *Vice-Chairman*, Coun. W. P. Burton.

Kearsley Urban District Council Tramways, Council Office. Kearsley, Farnworth, S.O. *Clerk U. D. C.*, H. Martin.

[Lines leased to and worked by the South Lancashire Tramways Co.]

Keighley Corporation Tramways, Coney Lane, Keighley. [T.A., Tramways, Keighley; T.N., 13 & 263.] *Gen. Manager and Elec. Eng.*, H. Webber; *Chairman Try. Com.*, Coun. A. Smith.

Kilmarnock Corporation Tramways Electricity Works, Kilmarnock. [T.N., 95.] *Elec. Eng. and Manager*, W. C. Bexon; *Consulting Engineers*, Kennedy and Jenkin; *Convener Try. Com.*, Coun. R. Lorimer.

Digitized by Google

ELECTRIC TRAMWAYS IN THE UNITED KINGDOM

Kirkcaldy Corporation Tramways, Electricity Works Victoria Road, Kirkcaldy. [T.A., Tramways, Kirkcaldy. T.N., 124, 174, and 175.] *Manager & Elec. Eng.*, O. F. Francis; *Traffic Manager*, Jas. Fisher; *Chairman Try. Com.*, Coun. G. Fergusson.

Lancaster Corporation Tramways, Electricity Works, Lancaster. [T.A., Milnes, Tramways, Lancaster; T.N., 1, L.] *Gen. Manager & Elec. Eng.*, G. C. Milnes; *Acting Boro. Electrical Engineer and Tramways Manager*, J. B. Patterson; *Traffic Manager*, W. T. Charlton; *Chairman Try. Com.*, Coun. T. Wilkinson.

Leeds City Tramways, Swinegate, Leeds. [T.A., Tramways, Leeds; T.N., 21601; *General Manager*, J. B. Hamilton; *Traffic Supt.*, A. Daggett; *Elec. Eng.*, John Burbridge; *Highways and Per. Way Eng.*, R. B. Holt; *Car Works Supt.*, G. E. Watmough; *Chairman Try. Com.*, Ald. R. A. Smithson; *Vice-Chairman*, Ald. H. Brown.

Leicester Corporation Tramways, 20 and 22, Humberstone Gate, Leicester. [T.N., 2177.] *Manager & Sec.*, A. F. Lucas; *Boro. & Try. Eng.*, E. G. Mawbey; *Boro. Elec. Eng.*, T. R. Smith; *Cons. Engs.*, Kincaid, Waller & Manville; *Chairman Try. Com.*, Ald. S. Flint, J.P.; *Vice-Chairman*, Ald. G. Banton, J.P.

Leith Corporation Tramways, 165, Leith Walk, Leith. [T.N., 415.] *Gen. Manager*, F. A. Fitzpayne; *Per. Way Eng.*, J. R. Findlay (*Burgh Eng.*); *Chairman Try. Com.*, Bailie Goalen.

Leyton District Council Tramways, Car Depot, Lea Bridge Road, Leyton, E. [T.A., Tramways, Leyton; T.N., 17 Walthamstow.] *Manager*, F. Schofield; *Elec. Eng.*, F. Harman Lewis; *Per. Way Eng.*, E. H. Essex; *Chairman Try. Com.*, Coun. F. M. Read.

Lincoln Corporation Tramways, Brayford Side North, Lincoln. [T.A., Clegg 109 Lincoln; T.N., 109]. *General Manager and Elec. Eng.*, Stanley Clegg; *Chairman Try. Com.*, Ald. W. S. White.

Liverpool Corporation Tramways, 24, Hatton Garden, Liverpool. [T.A., Tramways, Liverpool; T.N., 6054 and 7701, Central.] *General Manager*, C. W. Mallins; *Deputy Manager*, P. Priestly; *Per. Way Eng.*, J. A. Brodie (*City Engineer*); *Rolling Stock Supt.*, T. Ridyard; *Chairman Try. Com.*, Ald. E. Russell Taylor; *Vice-Chairman*, Ald. F. Smith, J.P.

London County Council Tramways, 23, Belvedere Road, Lambeth, London, S.E.1. [T.A., Lotram, Watloo, London; T.N., 4335 Hop] *General Manager*, A. L. C. Fell; *Traffic Manager*, J. K. Bruce; *Electrical Engineer*, P. L. Riviere; *Rolling Stock Eng.*, W. E. Ireland; *Per. Way Eng.*, J. Welling; *Chairman Highways Com.*, G. H. Hume; *Vice-Chairman*, A. H. Scott, J.P.

Lowestoft Corporation Tramways, Norwich Road, Lowestoft. [T.N., 87.] *Gen. Manager*, H. H. Saunders; *Elec. Eng.*, W. R. May; *Chairman Try. Com.*, Coun. F. Spashett (Mayor).

Maidstone Corporation Tramways, Tramway Offices, Tonbridge Road, Maidstone. [T.A., Lambert, Tramways, Maidstone; T.N., 448] *Gen. Manager and Elec. Eng.*, A. T. Lambert; *Chairman Try. Com.*, Ald. D. T. J. Lyle; *Vice-Chairman*, Coun. Green.

Manchester Corporation Tramways, 55, Piccadilly, Manchester. [T.A., Tramways, Manchester; T.N., 7800 City.] *Gen. Manager*, J. M. McElroy; *Traffic Sup.*, J. T. Oakes; *Elec. Eng.*, J. J. McMahon; *Chief Civil Eng.*, H. Mattinson; *Rolling Stock Supt.*, G. R. Blackburn; *Chairman Try. Com.*, Ald. J. Bowes; *Vice-Chairman*, Ald. A. W. Chapman.

Middlesex County Council Light Railways, Middlesex Guildhall, Westminster, London, S.W. *County Eng.*, H. T. Wakelam, M.I.C.E.; *Chairman of Light Railways Com.*, County Ald. H. Burt; *Vice-Chairman*, County Ald. F. Goodyear.

Middleton Corporation Tramways.
[These lines are leased to and worked by Manchester Corporation Tramways.]

Nelson Corporation Light Railways, Charles Street, Nelson. [T.N., 115.] *Manager and Elec. Eng.*, G. F. Nayler; *Per. Way Eng.*, W. Shackleton; *Chairman Try. Com.*, Coun. W. F. Cooke.

Newcastle-upon-Tyne Corporation Tramways, Manors, Newcastle. [T.A., Traction, Newcastle; T.N., 913 and 914 Central.] *Gen. Manager & Engineer*, Ernest Hatton; *Traffic Supt.*, T. Chalder; *Per. Way Eng.*, W. J. Steele; *Chairman Try. Com.*, Coun. R. Mayne; *Vice-Chairman*, Coun. A. M. Sutherland (Lord Mayor).

Newport (Mon.) Corporation Tramways, Town Hall, Newport, Mon. [T.A., Dynamo, Newport, Mon.; T.N., 3111 and 2932, Nat.] *Gen. Manager*, N. J. Young; *Boro. Elec. and Tramways Eng.*, A. Nichols Moore; *Chairman Try. Com.*, Coun. J. Moxon; *Vice-Chairman*, Ald. F. Phillips.

Northampton Corporation Tramways, St. James', Northampton. [T.N., 279 & 280.] *Gen. Manager and Elec. Eng.*, J. F. Cameron; *Chairman Try. Com.*, Coun. T. D. Lewis; *Vice-Chairman*, Coun. W. Beale.

Nottingham Corporation Tramways, Beastmarket Hill, Nottingham. [Tramways, Nottingham; T.N., 225.] *General Manager & Elec. Eng.*, John Aldworth; *Traffic Supt.*, H. Morley; *Per. Way Eng.*, Arthur Brown (*City Eng.*); *Rolling Stock Supt.*, W. Boot; *Chairman Try. Com.*, Coun. R. H. Swain, J.P.; *Vice-Chairman*, Ald. F. R. Radford, J.P.

Oldham Corporation Tramways, Wallshaw Depot, Oldham. [T.A., Tramways, Oldham; T.N., 1495.] *Gen. Manager & Eng.*, Wm. Chamberlain; *Traffic Supt.*, M. Mullin; *Chairman Try. Com.*, Coun. Cheetham.

Perth Corporation Tramways, 128, High Street, Perth. [T.N., 226 & 101.] *Tramways Manager*, W. G. Snell; *Elec. & Tramways Eng.*, John Lambert; *Per. Way Eng.*, R. McKillop (*Burgh Surv.*); *Chairman Try. Com.*, Coun. Calderwood.

Plymouth Corporation Tramways, 71 & 72, Old Town Street, Plymouth. [T.N. 518, Plymouth.] *Gen. Manager*, C. R. Everson; *Elec. Eng.*, E. J. Okell; *Chairman Try. Com.*, Ald. T. Baker; *Vice-Chairman*, Coun. J. Moon.

Pontypridd Urban District Tramways, Generating Station, Treforest, Pontypridd. [T.N. 33.] *Gen. Manager and Elec. Eng.*, J. E. Teasdel; *Traffic Supt.*, A. Armstrong; *Per. Way Eng.*, W. E. Lowe (*Surveyor*); *Chairman Try. Com.*, Coun. M. L. Jones.

Portsmouth Corporation Tramways, Town Hall, Portsmouth. [T.N., 4910 Corporation.] *Gen. Manager*, W. R. Spaven; *Elec. and Per. Way Eng., and Rolling Stock Supt.*, V. G. Lironi; *Traffic Supt.*, W. Munford; *Chairman Try. Com.*, Coun. J. Timpson; *Vice-Chairman*, Ald. R. Payne.

Preston Corporation Tramways, Holmrook Road, Preston. [T.A., Corporation Tramways, Preston; T.N., 273.] *Gen. Manager and Elec. Eng.*, J. F. Simpson; *Assistant Manager and Engineer*, H. Clayton; *Chairman, Try. Com.*, Ald. J. Ormrod; *Vice-Chairman*, Coun. T. Parkinson.

Radcliffe Urban District Council Tramways, Council Offices, Radcliffe, Lancs. *Res. Eng.*, H. Wilkinson; *Per. Way Eng.*, W. L. Rothwell; *Clerk*, S. Mills; *Chairman Try. Com.*, Coun. Lund.
[These tramways are worked as part of the Bury system.]

Rawtenstall Corporation Tramways, Bacup Road, Rawtenstall. [T.N., 81.] *Gen. Manager and Elec. Eng.*, C. L. E. Stewart; *Chairman Try. Com.*, Ald. H. Coupe, J.P.; *Vice-Chairman*, Coun. J. W. Stansfield.

Reading Corporation Tramways, Mill Lane, Reading. [T.A., Tramways Manager, Reading; T.N., 380.] *Gen. Manager & Elec. Eng.*, G. F. Craven; *Chairman Try. Com.*, Ald. C. G. Field, J.P.

Rochdale Corporation Tramways, Mellor Street, Rochdale. [T.A., Tramways, Rochdale; T.N., 48.] *Gen. Manager & Eng.*, G. Webster; *Traffic Manager*, R. Bentley; *Per. Way Eng.*, H. Yarwood; *Rolling Stock Supt.*, E. Sidgwick; *Chairman Try. Com.*, Ald. Taylor.

Rotherham Corporation Tramways, St. George's Hall, Rotherham. [T.A., Jagger, Rotherham; T.N., 152 and 241.] *General Manager*, H. Jagger; *Per. Way Eng.*, T. P. Collinge; *Rolling Stock Supt.*, C. A. Walker; *Chief Inspector*, W. G. Marks; *Chairman Try. Com.*, Ald. G. Gummer, J.P.; *Vice-Chairman*, Coun. Caine, J.P.

St. Helens Corporation Tramways, Town Hall, St. Helens, Lancs. *Chairman Try. Com.*, Coun. G. P. Varley; *Vice-Chairman*, Coun. W. N. Pilkington.
[Lines worked by the New St. Helens and District Tramways Co.]

Salford Corporation Tramways, 32, Blackfriars Street, Salford. [T.A., Tramways, Salford; T.N., 5367 and 5368 Central.] *Gen. Manager*, Geo. W. Holford; *Elec. Eng.*, J. A. Robertson; *Traffic Supt.*, J. W. Blakemore; *Per. Way Supt.*, E. B. Martin; *Rolling Stock Supt.*, R. Chadwick; *Chairman Try. Com.*, Ald. H. Linsley, J.P.; *Vice-Chairman*, Coun. W. H. Barrett.

Sheffield Corporation Tramways, 8, Division Street, Sheffield. [T.A., Tramways, Sheffield; T.N., 4600.] *General Manager*, A. R. Fearnley; *Traffic Supt.*, A. Handford; *Per. Way Eng.*, W. J. Hadfield; *Rolling Stock Supt.*, J. Smith; *Chairman Try. and Motors Com.*, Ald. Sir W. E. Clegg, J.P.; *Vice-Chairman*, Ald. W. C. Fenton, J.P.

Shipley Urban District Tramway, Dockfield, Shipley. [T.A., Electricity Works, Shipley; T.N., 190.] *Elec. Eng.*, Wm Redman; *Chairman Try. Com.*, H. Pitts.
[Lines leased to Bradford Corporation.]

Southampton Corporation Tramways, 161, Above Bar, Southampton. [T.A., Tramways, Southampton; T.N., 301.] *Gen. Manager*, W. T. Robson; *Boro. Elec. Engineer*, H. F. Street; *Traffic Manager*, C. G. Simpson; *Chairman Try. Com.*, Ald. F. A. Dunsford, J.P.

Southend-on-Sea Corporation Tramways, London Road, Southend-on-Sea. [T.N., 96.] *Gen. Manager and Elec. Eng.*, R. Birkett; *Traffic Manager*, J. T. Fayle; *Per. Way Eng.*, R. H. Dyer (*Acting Boro. Surveyor*); *Rolling Stock Supt.*, J. Dobson; *Chairman Try. Com.*, Coun. G. Radford.

Southend Pier Electric Railway, (owned and worked by Southend-on-Sea Corporation), [T.A., Piermaster, Southend; T.N., 91.] Southend-on-Sea. *Elec. Eng.*, C. R. Norton; *Acting Piermaster*, J. C. Herbert; *Chairman*, Coun. F. Britain.

Southport Corporation Tramway, 44, Chapel Street, Southport. [T.N., 116.] *Gen. Manager*, T. J. Kendrew; *Boro' Elec. Eng.*, A. S. Black; *Chairman Try. Com.*, Coun. Clayton; *Vice-Chairman*, Coun. Richardson.

South Shields Corporation Tramways, Dean Road, South Shields. [T.A., Tramways, South Shields; T.N., 157.] *Gen. Manager & Elec. Eng.*, J. C. Whiteley; *Boro. Elec. Eng.*, H. S. Ellis; *Chairman Try. Com.*, Ald. W. G. Wylie; *Vice-Chairman*, Coun. J. G. Winskell.

Stalybridge Hyde, Mossley, and Dukinfield Tramways and Electricity Board, Waterloo Road, Stalybridge. [T.N., 311.] *Commercial Manager*, F. Schofield; *Chief Eng.*, R. Blackmore; *Chairman Try. Com.*, Ald. R. Wood; *Vice-Chairman*, Coun. S. C. Homer.

Stockport Corporation Tramways, Mersey Square, Stockport. [T.N., 232 and 237.] *Manager*, A. T. Eardley; *Elec. Eng.*, R. Lomax; *Chairman Try. Com.*, Coun. T. W. Potts, O.B.E.; *Vice-Chairman*, Coun. C. Littler.

Sunderland Corporation Tramways, Tramway Offices, Monkwearmouth, Sunderland. [T.A., Trys. Manager, Sunderland; T.N., 948.] *Gen. Manager and Elec. Eng.*, A. R. Dayson; *Chairman Try. Com.*, Ald. G. New, J.P.; *Vice-Chairman*, Coun. W. Walker, J.P.

Swindon Corporation Tramways, Electricity Works, Swindon. [T.A., Tramways, Swindon; T.N., 4.] *Manager*, T. Medcalf; *Acting Elec. Eng.*, F. Newey; *Chairman Try. Com.*, Coun. Horder; *Vice-Chairman*, Coun. Stevens.

Wallasey Corporation Tramways, Seaview Road, Wallasey. [T.A., Tramways, Liscard; T.N., 1431, Liscard.] *General Manager*, R. R. Greene; *Elec. Eng.*, J. H Crowther; *Per. Way Eng.*, W. H. Travers; *Chairman Try. Com.*, Coun. F. E. Howse; *Vice-Chairman*, Coun. H. W. Griffin.

Walsall Corporation Tramway, St. Paul's Buildings, The Bridge, Walsall. [T.A., Tramways, Walsall; T.N., 238 & 559.] *Gen. Manager*, R. L. Horsfield; *Elec. Eng.*, H. A. Howie; *Per. Way Eng.*, J. Taylor (*Boro. Surveyor*); *Chairman, Try. Com.*, Ald. J. Cope; *Vice-Chairman*, Ald. J. Williams.

Walthamstow Urban District Council Tramways, Chingford Road, Walthamstow, [T.A., Tramways, Walthamstow; T.N., 20.] *Tramways Manager*, W. Murray; *Elec. Eng.*, G. R. Spurr (Priory Avenue, Walthamstow); *Per. Way Eng.*, G. W. Holmes; *Chairman Trys. Com.*, Coun. Clarke.

Warrington Corporation Tramways, Mersey Street, Warrington. [T.N., 196] *Gen. Manager*, J. Telfer; *Elec. Eng.*, F. V. L. Mathias; *Chairman Try. Com.*, Coun. Dr. G. W. Joseph; *Vice-Chairman*, Ald. J. Wilkinson.

West Bromwich Corporation Tramway, Electricity Works, West Bromwich. [T.N., 100.] *Boro. Eng.*, A. D. Greatorex; *Boro. Elec. Eng.*, W. A. Jackson; *Chairman Highways Com.*, Ald. A. G. Turley, J.P.; *Vice-Chairman*, Ald. G. Garratt.
[These tramways are leased to the South Staffs. (Lessee) Co., Ltd.]

West Ham Corporation Tramways, Greengate Street, Plaistow, London, E. [T.A., Trameurs, Plais., London; T.N., 862 and 868 East.] *General Manager*, L. Slattery; *Boro' Elec. Eng.*, J. W. Beauchamp; *Chairman Try. Com.*, Coun. Kensett.

West Hartlepool Corporation Tramways, Cleveland Road, West Hartlepool. [T.N., 6073.] *Gen. Manager & Eng.*, Chas. Burgess; *Chairman Try. Com.*, Ald. Martin; *Vice-Chairman*, Coun. Charlton.

Wigan Corporation Tramways, Market Place, Wigan; [T.N., 226.] *Gen. Manager*, F. Buckley; *Traffic Supt.*, T. B. Herner; *Rolling Stock Supt.*, R. Jones; *Per. Way Eng.*, R. B. Donald; *Chairman Try. Com.*, Ald. R. T. Fletcher; *Vice-Chairman*, Coun. J. Walkden.

Wolverhampton Corporation Tramways, Municipal Tramway Offices, Cleveland Road, Wolverhampton. [T.N., 324.] *Gen. Manager and Engineer*, C. O. Silvers; *Boro. Elec. Eng.*, S. T. Allen; *Per. Way Eng.*, George Green; *Chairman Try. Com.*, Ald. Sir C. T. Mander, Bart., J.P.; *Vice-Chairman*, Ald. S. Craddock, J.P.

York Corporation Tramways, 8, Clifford Street, York. [T.N., 302]. *Gen. Manager and Elec. Eng.*, J. W. Hame; *Traffic Supt.*, J. W. Horton; *Per. Way Eng.*, F. W. Spurr (City Surveyor); *Chairman Try. Com.*, Ald. S. W. Meyer; *Vice-Chairman*, Coun. W. H. Sessions.

COMPANY TRAMWAYS

Aberdeen Suburban Tramways Company, 15, Golden Square, Aberdeen. [T.A., Judicial, Aberdeen; T.N., 447.] *Manager & Per. Way Eng.*, A. Wilkie; *Sec.*, G. Duncan; *Chairman*, James Mearns; *Directors*, Dr. Christie, Jas. Sellar.

Airdrie and Coatbridge Tramways Company, Tramway Depôt, Main Street, Coatbridge [T.N., 105], and Manchester Hotel, London, E.C. *Gen. Manager*, A. Robertson; *Sec.*, P. N. Gray; *Chairman*, W. L. Madgen; *Directors*, H. S. Day, A. C. Miles, G. J. Somerville.

Barnsley and District Electric Traction Company, Ltd., Car Depot, Sheffield Road, Barnsley. [T.A., Tramways, Barnsley; T.N., 159.] *General Manager*, W. E. Nicoll; *Acting Sec.*, P. N. Gray; *Chairman*, E. Garcke; *Directors*, Col. Sir Thomas Pilkington, Bart., E. A. Paris.

Barrow-in-Furness Tramways, Salthouse Road Depot, Barrow, and Electrical Federation Offices, Manchester Hotel, London, E.C. [T.A., Tramways, Barrow; T.N., 125.] *Manager*, J. R. Groves; *Sec.*, F. J. Cursons; *Acting Sec.*, J. S. Bowker; *Chairman*, C. G. Tegetmeier; *Directors*, J. V. Kitchener, E. R. Soames.

Bath Electric Tramways Company, Ltd., Walcot Street, Bath, and 119-125, Finsbury Pavement, London, E.C. [T.A., Trams, Bath; T.N., 1214.] *Gen. Manager and Eng.*, W. E. Hardy; *Traffic Supt.*, E. Seckington; *Sec.*, H. J. Almond; *Chairman*, J. B. Hamilton; *Directors*, H. F. Clutterbuck, E. H. R Trenow, A. A. C. Swinton.

Bessbrook and Newry Tramway Company, Bessbrook, Co. Armagh. [T.A., Tramways, Bessbrook.] *Manager*, M. Hamilton; *Eng.*, H. Dowell *Chairman*, J. N. Richardson; *Directors*, C. H. Richardson, R. T. Scott, T. W. Richardson, T. McGreggor Greer.

Birmingham District Power and Traction Company, Power Station, Downing Street, Smethwick, and Manchester Hotel, London, E.C. [T.A., Power Station, Smethwick; T.N., 65 Smethwick.] *Gen. Manager*, W. G. Bond; *Secretary*, B. Kingsford; *Chairman*, C. Shirreff Hilton; *Directors*, J. A. Lycett, W. L. Madgen, S. R. Blundstone, R. J. Howley.

Digitized by Google

ELECTRIC TRAMWAYS IN THE UNITED KINGDOM

Blackpool and Fleetwood Tramroad Company, Ltd., Bispham, near Blackpool. [T.A., Cameron, Blackpool; T.N., 121.] *General Manager and Secretary*, J. Cameron; *Elec. Eng.*, A. Cameron; *Chairman*, John Greenwood; *Directors*, R. H. Prestwich, R. B. Barningham, R. S. Boddington, G. Richardson, G. Readman.

Blackpool and Fylde Light Railway Company, 5, Clifton Street, Blackpool. (No appointment of engineer or officials yet made.) *Secretary*, R. Bibby; *Chairman*, John Greenwood; *Directors*, T. Fisher, J.P., John Platt, J.P., W. Hardman, J.P., R. H. Mabbott.

Blackpool, St. Anne's, and Lytham Tramways Company, Ltd., Squires Gate, and 80, Birley Street, Blackpool. [T.N., 327 and 22]. *Gen. Manager and Elec. Eng.*, H. W. Laing; *Traffic Manager*, G. W. Wood; *Rolling Stock Supt.*, J. Partington; *Secretary*, Chas. E. Riding; *Chairman*, G. Nicholson; *Directors*, T. M. Smith, T. Preston.

Brighton Beach Electric Railway, Madeira Road, Brighton. [T.A., Volk, Brighton; T.N., 14 P.O.] *Manager and Eng.*, Magnus Volk; *Traffic Superintendent*, Miss Barton; *Per. Way Eng.*, J. Barker; *Secretary*, A. Volk; *Chairman*, Magnus Volk; *Directors*, M. H. Volk, B. W. Symonds, A. Volk.

Bristol Tramways and Carriage Company, Ltd., Clare Street House, Bristol. [T.A., Cab, Bristol; T.N., 74 & 3074 Nat.] *Manager*, Chas. Challenger; *Assist. Manager*, W. H. Stradling; *Electrical Engineer*, W. Nairn; *Permanent Way Engineer*, G. T. C. Edwards; *Secretary*, H. F. Cooper; *Chairman*, S. White, J.P.; *Directors*, W. G. Verdon Smith (*Managing*), J. H. Howell, J.P., Sir G. Stanley White, Bart., S. E. Baker.

British Electric Traction Company, Ltd., Manchester Hotel, London, E.C. E. Garcke (*chairman*); *Directors*, C. Shirreff, B. Hilton, W. L. Madgen, Sir Charles Ollivant, A. Shepherd, C. G. Tegetmeier, P. D. Tuckett; *Joint Managers*, C. H. Dade and R. J. Howley; *Secretary*, T. Bower; *Accountant*, C. Walmsley.

This company is interested in the following tramways, particulars of which are given under their respective names:

Airdrie & Coatbridge.
Barnsley & District.
Barrow-in-Furness.
Birmingham & District Power & Traction Co.:
Birmingham & Midland
Dudley, Stourbridge, & District.
South Staffordshire.
Wolverhampton Dist.
Devonport & District.
Gateshead & District.
General Elec. Tramways.
Gravesend & Northfleet.
Greenock & Port Glasgow.
Jarrow & District.
Kidderminster & District.
Merthyr.
Middleton.
Oldham, Ashton, & Hyde.
Peterborough.
Potteries.
Rothesay.
Sheerness & District.
Swansea.
Taunton.
Tynemouth & District.
Weston-super-Mare & District.
Worcester.
Wrexham & District.
Yorkshire (Woollen Dist.)

Burton and Ashby Light Railway, Power Station, Swadlincote, nr. Burton-on-Trent. [T.A., Toulmin, Swadlincote; T.N., 1.] *Manager and Eng.*, Jas. Toulmin; *Secretary*, W. N. Bancroft; *Chairman*, G. Murray Smith.

[The line is owned and worked by the Midland Railway Company.]

Camborne and Redruth Tramways, Elec. Works, Carn Brea, R.S.O., Cornwall. [T.N., 3, Camborne.] (Owned by Urban Elec. Supply Co.) *Manager and Eng.*, L. A. Hards; *Sec.*, C. H. Jones; *Chairman*, P. D. Tuckett; *Directors*, E. Charrington, H. B. Grotian, Sir Douglas Owen.

Carlisle Tramways Company, Ltd., City of, Depot and Offices, London Road, Carlisle. [T.A., Tramways, Carlisle; T.N., 0180.] *Engineer and Manager*, R. Watson.

Chatham and District Light Railways Company, Luton Road, Chatham, and 88, Cannon Street, London, E.C. [T.A., Tramways, Chatham; T.N., 51.] *General Manager*, W. Jensen; *Assist. Manager*, A. J. Bousfield; *Secretary*, A. Clements; *Chairman*, A. R. Monks; *Directors*, H. C. Levis, J. F. Nauheim, W. B. H. Martindale.

Cheltenham and District Light Railway Company, Cheltenham. [T.N., 341.] *Chairman*, A. R. Holland; *Directors*, A. H. Beatty, W. Shearer, H. L. Williams, A. S. Guinness, H. J. McCormick; *Sec.*, Wm. C. Bryden, C.A., 66, Queen Street, London, E.C.; *Local Eng. and Manager*, Henry J. McCormick, Dalkeith, Gloucester Road, Cheltenham.

Clontarf and Hill of Howth Tramroad Company, 89, Dame Street, Dublin. [T.A., c/o Railways, Dublin; T.N., 917.] *Secretary*, J. P. Chapman; *Chairman*, W. L. Murphy; *Directors*, E. Anderson, J. J. Dudley.

Cork Electric Tramways and Lighting Company, Ltd., Albert Street, Cork. [T.A., Tramways, Cork; T.N., 78 and 535.] *Manager and Engineer*, H. H. Nalder; *Traffic Manager*, H. G. Whiting; *Per. Way Engineer*, H. Mack; *Secretary*, A. Clements; *Chairman*, A. R. Monks; *Directors*, E. Anderson, W. M. Murphy, Capt. W. Martindale, H. C. Levis.

Dartford Urban District Council Light Railways. Car Depot, Priory Road, Dartford. [T.N., 31 Dartford.] (Leased to and worked by Bexley Urban District Council, Broadway, Bexleyheath, Kent).

Devonport and District Tramways Company, Electrical Federation Offices, Manchester Hotel, London, E.C. *Secretary*, S. M. Wright; *Acting Sec.*, P. N. Gray; *Chairman*, C. S. B. Hilton; *Directors*, J. S. Raworth, E. R. Soames, C. G. Tegetmeier, R. J. Sutcliffe.

[This Company's undertaking has been sold to Plymouth Corporation.]

Dewsbury, Batley, and Birstall Tramways Company, Ltd., Electrical Federation Offices, Manchester Hotel, London, E.C.

[Lines worked by Yorkshire (Woollen District) Electric Tramways, Ltd., *q.v.*]

Dewsbury and Ossett Corporation and Soothill Nether Urban District Council Tramways, (Lessees: The National Elec. Construction Co., Ltd., 62 and 63, Queen Street, London, E.C.) [T.A., Overhauled, London; T.N., 6616 and 6617 City.] *Manager*, W. MacGibbon.

Douglas—Ramsey. (The Manx Elec. Rly. Company), 1, Strathallan Crescent, Douglas. (See Manx Electric Railway Company).

Douglas Southern Electric Tramways, Ltd., Marine Drive, Douglas, Isle of Man, and 24, Brazennose Street, Manchester. [T.A., Traffic, Douglas.] *Manager and Eng.*, R. Orton; *Sec.*, J. E. Sharples; *Chairman*, T. J. Hutchinson; *Directors*, I. E. Winslow, E. A. Hopkins.

Dublin and Lucan Electric Railway Company, 15, Conyngham Road, Dublin. [T.A., Lucan Tramway, Dublin; T.N. 2282, 4005 and 4006 Dublin, and 5 Lucan.] *Manager, Elec. Eng., and Sec.*, D. McDowall Grosart, J.P.; *Chairman*, J. W. Hill, J.P.; *Directors*, E. Anderson, J.P., A. B. Coyle, J.P., G. V. Murphy, J. R. Dillon.

Dublin United Tramways Company (1896), Ltd., 9, Upper Sackville Street, Dublin. [T.A., Tramways, Dublin; T.N., 58 and 59.] *Gen. Manager*, G. Marshall Harriss; *Elec. Eng.*, R. Tanham; *Con. Eng.*, H. F. Parshall; *Per. Way Eng.*, P. F. O'Sullivan; *Secretary*, W. McHugh; *Chairman*, W. M. Murphy, J.P.; *Directors*, Joseph Mooney, J.P., Rt. Hon. L. A. Waldron, P.C., William Hewat.

Dudley, Stourbridge and District Electric Traction Company, Ltd. (Section of The Birmingham and Midland Tramways Joint Committee), Power Station, Downing Street, Smethwick, Brierley Hill, Staffs., and Manchester Hotel, London, E.C. [T.N., 65 Smethwick.] *General Manager*, W. G. Bond; *Secretary*, E. H. Woodhall; *Chairman*, S. R. Blundstone; *Directors*, J. A. Lycett, R. J. Howley, B. Kingsford (*Acting Sec.*)

Dumbarton Burgh and County Tramways Company, Tramway Depot, Dumbarton, and 28, Rutland Street, Edinburgh. [T.A., Tramways, Dumbarton; T.N., 119.] *Gen. Manager and Elec. Eng.*, J. P. McMahon; *Secretary*, A. Dishart; *Chairman*, G. Balfour; *Directors*, K. Sanderson, K. A. Scott Moncrieff.

Dundee, Broughty Ferry & District Tramways Company, Milton, Monifieth, N.B. [T.N., 24 Monifieth.] *Gen. Manager and Engineer*, George Brander; *Secretary*, E. Cowan; *Chairman*, George Balfour; *Directors*, Edward Cowan, David Hynd.

Dunfermline and District Tramways Company, Tramway Depot, Cowdenbeath, Fife, and 8, New Row, Dunfermline. *Manager and Engineer*, J. H. Shepherd; *Secretary*, G. A. Nicolson; *Cons. Engs.*, Hawtayne & Zeden; *Directors*, Wm. Low, G. Balfour (*managing*), K. Sanderson, D. Hynd.

Falkirk & District Tramways Company, Larbert Road, Larbert, Stirlingshire. [T.A., Tramways Co., Falkirk; T.N., 154 Falkirk.] *Gen. Manager and Engineer*, D. Hays; *Chairman*, G. M. Brown; *Directors*, A. W. Tait, R. Hunter, G. Balfour, C. D. Geddes.

Felixstowe Pier Railway, Felixstowe. (The Coast Development Corporation, Ltd.) *Elec. Eng.*, E. A. Lambert.

Gateshead and District Tramways Company, Tramway Depôt, Sunderland Road, Gateshead, and Electrical Federation Offices, Manchester Hotel, London, E.C. [T.A., Tramway Depôt, Gateshead; T.N., 125 & 408 Gateshead.] *General Manager*, William Morrison; *Secretary*, H. W. Davis; *Chairman*, H. S. Day; *Directors*, H. A. Stagg, C. R. Greene, J.P., Judge L. A. Atherley-Jones, K.C.

Giant's Causeway and Portrush Electric Tramway Company, Portrush. *Manager & Sec.*, W. McCurdy; *Elec. Eng.*, W. A. Traill; *Chairman*, J. S. Moore; *Directors*, A. B. Stuart, W. A. Traill.

Glossop Tramways, Electricity Works, Glossop (owned by the Urban Electric Supply Co.) [T.N., 34, Glossop.] *Manager and Res. Eng.*, C. E. Knowles; *Rolling Stock Supt.*, T. L. Podmore; *Secretary*, C. H. Jones; *Chairman*, P. D. Tuckett; *Directors*, E. Charrington, F. E. Gripper, H. B. Grotrian, D. Owen.

Gosport and Fareham Tramways, Tramways and Lighting Office, Gosport, Hants., and Moorgate Station Chambers, London, E.C. [T.A., Tramways, Gosport; T.N., 3, Post Office, Gosport.] *Eng. and Manager*, J. Fereday Glenn; *Sec.*, J. Barber Glenn; *Chairman*, A. Beattie, J.P., D.L.; *Directors*, J. Barber Glenn (*managing*), S. Hern.

Gravesend & Northfleet Electric Tramways, Ltd., Tramway Depot, Northfleet, Kent, and Manchester Hotel, London, E.C. [T.N., 958, Gravesend.] *Manager*, J. Dobson; *Sec.*, H. C. Walter; *Acting Sec.*, J. S. Bowker; *Chairman*, E. Garcke; *Directors*, W. L. Madgen, P. N. Gray, W. S. Wreathall.

Great Crosby Tramways, 31, James Street, Liverpool.

[This tramway is worked by the Liverpool Overhead Railway Company.]

Great Grimsby Street Tramway Co., Southampton House, Cleethorpes, and Moorgate Station Chambers, London, E.C. [T.A., Blanco, Cleethorpes; T.N., 16.] *Manager and Eng.*, H. L. White; *Elec. Eng.*, H. O. White; *Managing Director and Secretary*, J. B. Glenn; *Chairman*, A. Beattie, J.P., D.L.; *Director*, S. Hern.

Greenock and Port Glasgow Tramways Company, Ladyburn, Greenock, and Manchester Hotel, London, E.C. [T.A., Tramways, Greenock; T.N., 562]. *Manager*, A. Robertson; *Secretary*, P. N. Gray; *Chairman*, W. L. Madgen; *Directors*, G. J. Somerville, A. C. Miles, H. S. Day.

Guernsey Railway Company, Ltd., Hougue-à-la-Perre, Guernsey. *Manager and Elec. Eng.*, Arthur G. Bird; *Sec.*, J. de Mouilpied; *Chairman*, G. F. Peek; *Directors*, W. D. Murdoch, J. B. Collings, Q. Le Pelley, T. W. Palmer.

Hampshire Light Railway (Electric) Company, Ltd., Moorgate Station Chambers, London, E.C. *Secretary*, J. B. Glenn; *Chairman*, A. Beattie, J.P.; *Directors*, J. Barber Glenn (*managing*), S. Hern.

[This company works the Portsdown and Horndean Light Railway.]

Hastings Tramways Company, Ltd., Beaufort Road, Silverhill, St. Leonards-on-Sea, and 1, Queen Victoria Street, London, E.C. [T.A., Tramways, Hastings, and Enshrine, London; T.N., 90 Hastings, and 3465, City]. *General Manager and Elec. Eng.*, W. Vincent Edwards; *Secretary*, W. R. Elston; *Chairman*, G. Kitchen; *Directors*, J. C. Williamson, Dr. Moody.

Imperial Tramways Company, Ltd., Clare Street House, Bristol. *Secretary*, F. H. Withers; *Manager*, F. Freshwater; *Chairman*, S. White, J.P.; *Directors*, W. G. Verdon Smith (*Managing*), J. H. Howell, Sir G. Stanley White, Bart.

Isle of Thanet Electric Tramways and Lighting Company, Ltd., St. Peter's, Kent, and Moorgate Station Chambers, London, E.C. [T.A., Tramways, St. Peters, Kent; T.N., 29 Broadstairs]. *Gen. Manager and Elec. Eng.*, J. A. Forde; *Traffic Supt.*, ——————; *Secretary*, J. Barber Glenn; *Chairman*, A. R. Monks; *Directors*, Lord Arthur Butler, W. M. Murphy, H. Brown.

Jarrow and District Electric Traction Company, Ltd., Electrical Federation Offices, Manchester Hotel, London, E.C. [T.A., Jarrow, c/o Tramway, London; T.N., 2686 Holborn.] *Traffic Manager*, G. McClelland; *Secretary*, C. W. Francis; *Acting Sec.* H. A. Stagg; *Chairman*, G. J. Somerville; *Directors*, W. Morrison (*managing*), H. S. Day.

Kidderminster & District Electric Lighting and Traction Co., Ltd., Kidderminster, and Manchester Hotel, London, E.C. [T.N., 108]. *General Manager*, W. G. Bond; *Secretary*, B. Kingsford; *Chairman*, E. Garcke; *Directors*, J. A. Lycett, H. S. Day, W. L. Madgen.

Kinver Tramway, Kinver, and Electrical Federation Offices, Manchester Hotel, London, E.C., *q.v.*, Dudley, Stourbridge, and District Elec. Traction Co., Ltd.

Lanarkshire Tramways Company, Edinburgh Road, Motherwell, N.B., and 88, Cannon Street, London, E.C. [T.A., Tramways, Motherwell; T.N., 64.] *Gen. Manager and Eng.*, G. F. Moller; *Elec. Eng.*, E. H. Glennie; *Per. Way Eng.*, R. Foster; *Traffic Supt.*, J. L. White; *Sec.*, A. Clements; *Chairman*, A. R. Monks; *Directors*, Sir B. Cunard, H. C. Levis, W. H. Whaite, G. Franklin, J. F. Nauheim.

Lancashire United Tramways Limited, Atherton, Lancs. [T.A., Tramways, Atherton; T.N., 36, Atherton.] *Gen. Manager and Engineer*, E. H. Edwardes; *Secretary*, H. P. Conibear; *Chairman*, Hon. Sir A. Stanley G.B.E., M.P.; *Directors*, J. M. Henderson, M.P., R. Watson, J.P., A. Adam, J. S. Austen.

Liverpool and Prescot Light Railway.—This line, which with the St. Helens Tramways forms the connecting link between the City of Liverpool and South Lancashire Tramways, is owned and worked by the Lancashire United Tramways, Ltd.

Liverpool Overhead Railway Company, 31, James Street, Liverpool. [T.A., Motor, Liverpool; T.N., 5463 Central.] *Gen. Manager and Eng.*, E. J. Neachell; *Secretary*, H. G. Alexander; *Chairman*, H. C. Woodward; *Directors*, J. E. Anderson, G. D. Killey, J. U. Hodgson, M. H. Maxwell.

Llandudno and Colwyn Bay Electric Railway, Limited, Tramway Depôt, Rhôs-on-Sea, Colwyn Bay, and Basildon House, Moorgate Street, London, E.C. *Gen. Manager*, Alex. G. Balfour; *Secretary*, A. W. R. Lovering; *Directors*, G. Balfour, A. W. Tait, T. Stoker.

Llanelly and District Electric Lighting and Traction Company, Ltd., Llanelly, and 66, Queen Street, London, E.C. *Engineer and Manager*, J. E. Stewart; *Secretary*, W. C. Bryden; *Chairman*, A. R. Holland; *Directors*, A. V. Anderson, M. A. Edwards, A. H. Beatty.

London United Tramways Ltd., Electric Railway House, Broadway, Westminster, London, S.W. [T.N., 6800, Victoria.] *Managing Director*, J. Devonshire; *Secretary*, A. L. Barber; *Gen. Manager and Eng.*, C. J. Spencer; *Chairman*, W. M. Acworth; *Directors*, Rt. Hon. Viscount Knutsford, F. V. Schuster, W. C. Burton, H. A. Vernet.

Luton Corporation Tramways (leased to and worked by Balfour, Beatty & Co., Ltd., 22a, College Hill, London, E.C.), Tramway Offices, Park Street, Luton. [T.N., 230.] *Engineer and Manager*, A. E. Wray.

Mansfield & District Light Railway Co., Sutton Road, Mansfield, and 66, Queen Street, London, E.C. [T.A., Cars, Mansfield, T.N., 107.] *Gen. Manager*, C. R. Walker; *Secretary*, W. C. Bryden; *Chairman*, A. R. Holland; *Directors*, W. J. Chadburn, A. H. Beatty, G. Balfour, C. R. Walker.

Digitized by Google

ELECTRIC TRAMWAYS IN THE UNITED KINGDOM

Manx Electric Railway Company, Ltd., 1, Strathallan Crescent, Douglas, Isle of Man, and 3, Finch Lane, London, E.C. [T.A., Electric, Douglas, Man.; T.N., 61.] *Gen. Manager & Eng.*, F. Edmondson; *Secretary*, J. Featherston; *Chairman*, Sir W. H. Vaudrey; *Directors*, B. E. Greenwell, E. Remnant, C. A. Huni.

Merthyr Electric Traction and Lighting Company, Ltd., 53, Pontmorlais Circus, Merthyr, and Electrical Federation Offices, Manchester Hotel, London, E.C. [T.A., Tramway Company, Merthyr; T.N., 0180, Merthyr Tydfil.] *Managing Eng.*, L. W. Dixon; *Secretary*, H. A. Stagg; *Chairman*, G. J. Somerville; *Directors*, C. G. Tegetmeier, W. L. Madgen, E. R. Soames.

Metropolitan Electric Tramways, Limited, Electric Railway House, Broadway, Westminster, London, S.W. [T.A., Metrolito, London; T.N., 6800, Victoria.] Manor House Offices, Seven Sisters Road, N. [T.A., Lentiscus, London; T.N., 77 Tottenham.] *Gen. Manager and Eng.*, C. J. Spencer; *Traffic Manager*, W. E. Hammond; *Secretary*, A. L. Barber; *Chairman*, E. Garcke; *Directors*, W. L. Madgen, C. G. Tegetmeier, J. Devonshire (*Managing Director*).

Mexborough and Swinton Tramways Company, Electricity Works, Rawmarsh, Yorks. [T.N., 266], and 62 and 63, Queen Street, London, E.C. *Manager and Eng.*, G. H. Browne; *Consulting Elec. Eng.*, F. E. Stanley; *Commercial Manager*, Wm. T. Mitchell; *Traffic Supt.*, M. McLeod; *Secretary*, L. D. H. Jacobs; *Chairman*, L. B. Schlesinger; *Director* (*Managing*), W. B. Cownie, C.A.

Middlesbro, Stockton, and Thornaby Electric Tramway, Bridge Road, Stockton-on-Tees, and Clare Street House, Bristol. [T.A., Tramways, Stockton; T.N., 129.] *Manager*, F. Freshwater; *Secretary*, F. H. Withers; *Chairman*, Samuel White, J.P.; *Directors*, James H. Howell, J.P., Sir G. Stanley White, Bart., W. G. Verdon Smith (*Managing Director*).

Middleton Electric Traction Company, Ltd., Hiltonfold Lane, Middleton, and Electrical Federation Offices, Manchester Hotel, London, E.C. [T.A., Tramway Depot, Middleton; T.N., 37 Middleton.] *Gen. Manager*, W. F. Endean; *Secretary*, G. R. Oliphant; *Acting Secretary*, J. S. Bowker; *Chairman*, Lord Vaux of Harrowden; *Directors*, J. V. Kitchener, C. H. Dade.

Musselburgh and District Electric Light and Traction Co., Ltd., High St., Musselburgh, N.B. [T.A., Tramways, Musselburgh; T.N., 115.] (Registered Office, 62 and 63, Queen Street, London, E.C. [T.N., 6616 and 6617, City.]; *Manager*, E. J. Walsh; *Resident Engineer*, E. J. Walsh; *Traffic Inspector*, W. Mittell; *Secretary*, L. D. H. Jacobs; *Chairman*, L. B. Schlesinger; *Directors*, B. Burnham, J. Anderson, W. B. Cownie.

New General Traction Company, Ltd., 8, Crosby Square, London, E.C. *Managing Director*, E. A. Hopkins; *Secretary*, J. G. Mills; *Chairman*, Baron E. B. d'Erlanger.
[This company controls the Norwich and the Douglas Southern Electric Tramways Companies.]

New St. Helens and District Tramways Company, Ltd., Atherton, Lancs. [T.A., Tramways, Atherton; T.N., 36 Atherton.] *Engineer and Manager*, C. D. Stanley; *Secretary*, H. P. Conibear; *Chairman*, Hon. Sir Arthur Stanley, G.B.E., M.P.; *Directors*, J. Hunter, J.P., H. Martin, J.P., J. M. Henderson, M.P., J. S. Austen, and E. H. Edwardes (*Managing*).

North Shields Tramway Company owned and worked by Tynemouth and District Elec. Trac. Co. *q.v.*

Norwich Electric Tramway Company, 5, Orford Hill, Norwich, and 8, Crosby Square, London, E.C. [T.A., Tramways, Norwich; T.N., 475.] *Manager and Engineer*, ————; *Sec.*, J. G. Mills; *Directors*, E. A. Hopkins, F. FitzGerald, G. M. Chamberlin, C. Pakeman, R. J. West, and C. Tomlinson.

Nottinghamshire and Derbyshire Tramways Company, Tramway Depot, Langley Mill, Derbyshire, and 66, Queen Street, London, E.C. [T.A., Tramways, Langley Mill; T.N., 53, Langley Mill.] *Manager*, C. R. Walker; *Secretary*, Wm. C. Bryden; *Directors*, A. R. Holland, A. H. Beatty, C. R. Walker, and M. A. Edwards.

Oldham, Ashton and Hyde Electric Tramway, Ltd., Tramway Depot, Denton, Lancs., and Manchester Hotel, London, E.C. [T.A., Tramways, Denton: T.N., 265 Ashton.] *Supt.*, A. Anderson; *Secretary*, F. J. Cursons; *Acting Secretary*, J. S. Bowker; *Chairman*, E. Garcke; *Directors*, Judge L. A. Atherley Jones, K.C., W. S. Wreathall, J. V. Kitchener (*Managing Director.*)

Paisley District Tramways Company, Tramway Depôt, Paisley, and 88, Cannon Street, London, E.C. [T.N., 2938 Paisley.] *Gen. Manager and Elec. Eng.*, Fred Coutts; *Traffic Supt.*, E. Jeffs; *Secretary*, A. Clements; *Con. Eng.*, H. F. Parshall; *Chairman*, O. H. Smith; *Directors*, Lord Arthur Butler, D. Johnston Smith, John Young.

Peterborough Electric Traction Company, Ltd., Lincoln Road, Peterborough, and Manchester Hotel, London, E.C. [T.A., Tramways, Peterborough; T.N., 224.] *Gen. Manags*, P. R. Blake; *Secretary*, S. M. Wright; *Acting Sec.*, P. N. Gray; *Chairman*, R. J. Howley; *Directors*, E. A. Paris, Lord Vaux of Harrowden.

Plymouth, Stonehouse and Devonport Tramways Co., 16, Edgcumbe Street, Stonehouse, Devon, and Moorgate Station Chambers, London, E.C. [T.N. 53.] *Manager*, G. H. Moreton; *Elec. Eng.*, J. Graham Pearce; *Sec.*, J. Barber Glenn; *Chairman*, Andrew Beattie, J.P., D.L.; *Directors*, S. Hern, J. B. Glenn (*Managing*).

Portsdown and Horndean Light Railway, Cosham, Hants.; Tramways and Lighting Office, Gosport, Hants., and Moorgate Station Chambers, London, E.C. [T.A., Tramways, Gosport; T.N., 3, Post Office, Gosport.] *Engineer and Manager*, J. Fereday Glenn; *Secretary*, J. Barber Glenn; *Chairman*, A. Beattie, J.P., D.L.; *Directors*, J. Barber Glenn (*Managing*), S. Hern.

Potteries Electric Traction Company, Tramway Depôt, Stoke-on-Trent, and Electrical Federation Offices, Manchester Hotel, London, E.C. [T.A., Tramways, Stoke-on-Trent; T.N., 801 & 141.] *Gen. Manager and Eng.*, W. Thom; *Power & Rolling Stock Supt.*, F. J. Chapple; *Traffic Manager*, F. Hatch; *Secretary*, B. Kingsford; *Chairman*, R. J. Howley; *Directors*, F. W. Chanter, S. Mear, J. V. Kitchener.

Rhondda Tramways Company, Ltd., Tramway Depot, Porth, Rhondda, and 62 and 63, Queen Street, London, E.C. [T.A., Tramways, Porth; T.N., 118.] *Manager and Engineer*, H. Holliday; *Secretary*, L. D. H. Jacobs; *Chairman*, L. B. Schlesinger; *Directors*, J. C. Saunders, W. B. Cownie, J. T. Jervis, H. T. Barnett.

Rothesay Tramways Company, Ltd., Point House, Rothesay, and Manchester Hotel, London, E.C. *Manager*, A. Robertson; *Engineer*, H. T. Bates; *Sec.*, P. N. Gray; *Chairman*, A. C. Miles; *Directors*, W. L. Madgen, H. S. Day.

Ryde Pier Company, Ryde, Isle of Wight. *Secretary*, L. Tayler; *Elec. Eng.*, C. Harrison; *Chairman*, G. E. Mears.

Scarborough Tramways Company, Scalby Road, Scarborough. [T.A., Electric Tramways, Scarborough; T.N., 294.] *Gen. Manager and Elec. Eng.*, J. V. Moinet; *Chairman*, F. E. Gripper; *Directors*, M. T. Whittaker, J. C. Wigham.

Sheerness and District Electric Power and Traction Company, Ltd., Electricity Works, Sheerness East, and Electrical Federation Offices, Manchester Hotel, London, E.C. [T.A., Electricity Works, Sheerness East; T.N., 45.] *Manager & Eng.*, A. Charlton; *Sec.*, H. A. Stagg; *Chairman*, G. J. Somerville; *Directors*, R. J. Howley, E. R. Soames, J. E. Spagnoletti.

South Metropolitan Electric Tramways and Lighting Company, Ltd., 114, Church Street, Croydon, 30, High Street, Sutton, and Electric Railway House, Broadway, Westminster, London, S.W. [T.N., 304 Croydon, 14 Sutton and 6800, Victoria.] *Gen. Manager and Engineer*, A. V. Mason; *Secretary*, W. M. Wright; *Chairman*, C. G. Tegetmeier; *Directors*, J. Devonshire (*managing*), E. Garcke, A. L. Barber.

Southport Pier Co., Ltd., Southport. [T.A., Pier, Southport; T.N., 174.] *Manager*, A. T. Faiers; *Chairman*, A. Skinner; *Directors*, J. R. Haworth, S. J. Fane, G. Duckworth, J. Duckworth.

South Staffordshire Tramways (Lessee) Company, Ltd., Electrical Federation Offices, Manchester Hotel, London, E.C. [T.N., 65 Smethwick.] *General Manager*, W. G. Bond; *Secretary*, E. H. Woodhall; *Chairman*, W. S. Schuster; *Directors*, J. A. Lycett, S. R. Blundstone, R. J. Howley, B. Kingsford (*Acting Sec.*)

Sunderland District Electric Tramways, Ltd., Fence Houses, co. Durham. [T.A., Trams, Philadelphia, Shiney Row; T.N., 21, Houghton-le-Spring.] *Resident Manager and Engineer*, G. Stratton; *Traffic Manager*, E. A. Pearman; *Secretary*, H. J. Almond; *Directors*, H. R. Hogg, Hon. R. Parker, R. Tayler, A. Counter, C. Eves, W. B. Hopkins.

Sutton and Howth Electric Tramway Company (owned by the Great Northern Railway, Ireland), Sutton, county Dublin, and Amiens Street Station, Dublin. [T.A., Railroad, Dublin; T.N., 5181, Dublin, and 16 Sutton.] *Gen. Manager*, John Bagwell; *Elec. Eng.*, A. W. Whieldon; *Chief Eng.* F. A. Campion; *Locomotive Eng.*, G. T. Glover; *Sec.*, T. Morrison; *Chairman*, F. Vernon; *Directors*, W. P. Cairnes (*Deputy Chairman*), W. B. Carson, H. S. Guinness, J. T. Reade, Capt. W. L. A. Goulding, Lt.-Col. J. C. W. Madden, R. A. Gradwell, J. Milne Barbour, T. F. Cooke, W. H. B. Moorhead, Sir Geo. Clark, Bart.

Swansea Improvements and Tramways Company, 2, Rutland St., Swansea, and Manchester Hotel. Aldersgate Street, London, E.C. [T.A., Tramway, Swansea; T.N., 268 Swansea.] *Gen. Manager*, D. James; *Elec. Eng.*, A. Johnston; *Acting Secretary*, P. H. di Marco; *Chairman*, C. G. Tegetmeier; *Directors*, G. J. Somerville, S. E. Garcke, E. R. Soames.

Taunton Electric Traction Company, Ltd., East Reach, Taunton, and Electrical Federation Offices, Manchester Hotel, London, E.C. [T.A., Taunton, c/o "Tramways," London.] *Manager*, B. H. Griffith; *Secretary*, P. N. Gray; *Chairman*, G. J. Somerville; *Director*, E. Garcke.

Torquay Tramways Co., Ltd., St. Marychurch Road, Torquay. [T.A., Carsheds, Torquay; T.N., 167 Torquay.] *Registered Office*, 62 and 63, Queen Street, London, E.C. *Manager and Eng.*, H. J. Nisbett; *Secretary*, L. D. H. Jacobs; *Managing Director*, W. B. Cownie.

Trafford Park Company (Tramways), Trafford Park, Manchester. [T.A., Developing, Manchester; T.N., 61, Trafford Park.] *Secretary*, C. A. Grundy; *Chairman*, Marshall Stevens; *Directors*, H. McNiel, J. H. Balfour Browne, K.C., T. G. Mellors.
[Lines worked by the Manchester and Salford Corporations.]

Tynemouth and District Electric Traction Company, Limited, John Street, Cullercoats, Northumberland, and Electrical Federation Offices. Manchester Hotel, London, E.C. [T.A., Tram Co., Cullercoats; T.N., 17 Whitley.] *Gen. Manager*, H. J. Smith; *Sec.*, C. W. Francis; *Acting Sec.*, H. A. Stagg; *Chairman*, H. S. Day; *Directors*, R. J. Howley, Geo. J. Somerville, H. A. Stagg, Wm. Morrison.

Tyneside Tramways and Tramroad Company, Ltd., Neptune Bank, Wallsend. [T.A., Tramways, Wallsend; T.N., 84.] *Secretary & Res. Manager*, J. C. Little; *Elec. Eng.*, F. H. Briggs; *Cons. Eng.*, W. McLellan; *Chairman*, J. T. Merz; *Directors*, Lord Armstrong, J. H. Armstrong, G. E. Henderson, S. Hunter.

Walton-on-the-Naze Pier Tramway (Coast Development Corporation, Ltd.), The Pier, Walton-on-the-Naze. [T.A., Electricity Works, Walton-on-Naze.] *Eng.*, E. A. Lambert, A.M.I.E.E.

Wemyss and District Tramways Company, Ltd., Car Depot, Aberhill, Methill, N.B. [T.A., Tramways, Methill; T.N., 38 Leven.] *Gen. Manager*, W. T. Dawson; *Sec.*, J. O. Shepherd; *Chairman*, G. Balfour; *Directors*, W. Shepherd, G. Balfour, J. H. Guild, W. Shearer.

Weston-super-Mare and District Electric Supply Co., Ltd., Locking Road, Weston-super-Mare, and Electrical Federation Offices, Manchester Hotel, London, E.C. [T.A., Tramways, Weston-s.-Mare; T.N., 79 & 181.] *Manager and Elec. Eng.*, G. Charlton; *Sec.*, H. A. Stagg; *Chairman*, G. J. Somerville; *Directors*, C. G. Tegetmeier, E. R. Soames.

Wolverhampton District Electric Tramways, Limited, Tramway Depot, Bilston, and Manchester Hotel, London, E.C. [T.A., Tramways, Bilston; T.N., 56, Bilston.] *General Manager*, W. G. Bond; *Sec.*, E. H. Woodhall; *Chairman*, S. R. Blundstone; *Directors*, J. A. Lycett, R. J. Howley B. Kingsford (*Acting Sec.*)

Worcester Electric Traction Company, Ltd., St. John's, Worcester, and Electrical Federation Offices, Manchester Hotel, London, E.C. [T.A., Tramways, Worcester; T.N., 81.] *Engineering Manager*, C. H. Built; *Secretary*, C. W. Francis; *Acting Sec.*, J. S. Bowker; *Chairman*, H. S. Day; *Directors*, J. A. Lycett, B. Kingsford, W. S. Wreathall.

Wrexham and District Transport Co., Ltd. 6, Lord Street, Wrexham, and Manchester Hotel, London, E.C. [T.A., Tramways, Wrexham; T.N., 182, Wrexham.] *General Manager*, A. A. Hawkins; *Sec.*, J. R. Oliphant; *Acting Sec.*, J. S. Bowker; *Chairman*, J. V. Kitchener; *Directors*, G. J. Somerville, W. S. Wreathall, R. J. Howley.

Yorkshire (West Riding) Electric Tramways Co., Ltd., Belle Isle, Wakefield. [T.A., England, Belle Isle, Wakefield; T.N., 213.] *Gen. Manager and Sec.*, H. England; *Elec. Engs.*, C. J. Jewell and E. Mercer; *Traffic Supt.*, W. J. McDonald *Chairman*, Sir Herbert S. Leon, Bart.; *Directors*, B Newgass, G. E. Leon, E. Remnant, W. Murray.

Yorkshire (Woollen District) Electric Tramways, Limited, Frost Hill, Liversedge, and Electrical Federation Offices, Manchester Hotel, London, E.C. [T.A., Tramways, Heckmondwike; T.N., 8 Heckmondwike.] *Secretary*, P. N. Gray; *Chairman*, E. Garcke; *Directors*, Sir Thos. Pilkington, E. A. Paris (*managing*).

TRAMWAYS COMMITTEE
(BOARD OF TRADE)

JAMES DEVONSHIRE (*Chairman*)

JAMES DALRYMPLE.	J. B. HAMILTON.
A. R. FEARNLEY.	R. J. HOWLEY.
A. L. C. FELL.	J. M. MCELROY.

STEPHEN SELLON.

Secretary:
S. F. JAMES.

Offices: 8, Buckingham Gate, Westminster, London, S.W.1.

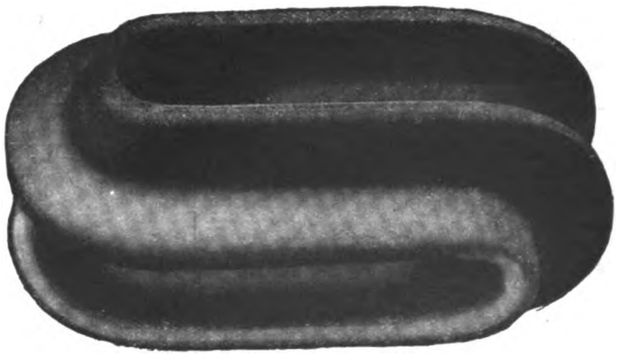
Telegrams: "Trambotcom," Sowest, London.
Telephone: No. 6976 Victoria.

AREA SUB-COMMITTEES

1. METROPOLITAN AND EAST COAST.
   J. K. BRUCE, *Chairman.*
   T. B. GOODYER, *Hon. Secretary,*
   Tramway Office, Thornton Heath, Croydon.
2. SOUTH-EAST AND SOUTH TO BOURNEMOUTH
   W. R. SPAVEN, *Chairman.*
   G. F. CRAVEN, *Hon. Secretary,*
   Tramway Offices, Mill Lane, Reading.
3. SOUTH-WEST AND SOUTH (excluding BOURNEMOUTH)
   W. G. VERDON SMITH, *Chairman.*
   W. E. HARDY, *Hon. Secretary,*
   Tramway Offices, Walcot Street, Bath.
4. MIDLANDS.
   ALFRED BAKER, *Chairman.*
   R. L. HORSFIELD, *Hon. Secretary,*
   Tramway Offices, Walsall.
5. LANCASHIRE, CHESHIRE & WALES (NORTH).
   C. W. MALLINS, *Chairman.*
   J. BARNARD, *Hon. Secretary,*
   Tramway Offices, Bolton.
6. YORKSHIRE AND LINCOLNSHIRE.
   C. J. SPENCER, *Chairman.*
   H. ENGLAND, *Hon. Secretary,*
   Tramway Offices, Belle Isle, Wakefield.
7. NORTHERN.
   E. HATTON, *Chairman.*
   G. A. CARR, *Hon. Secretary,*
   Tramway Office, Manors, Newcastle.
8. SCOTLAND.
   PETER FISHER, *Chairman.*
   FRED COUTTS, *Hon. Secretary,*
   Tramway Offices, Paisley.
9. WALES (SOUTH).
   ARTHUR ELLIS, *Chairman.*
   N. J. YOUNG, *Hon. Secretary,*
   Town Hall, Newport.

Digitized by Google

PRESCOT INSULATORS



Regd. No. 639667/14.

These Insulators are insulators all through and do not depend on the attractive green glaze for their insulating qualities.

They are designed to maintain their alignment when erected, and their mechanical and electrical factors of safety are high.

The following are particulars of the sizes stocked:

	D 4411	D 4412
Working Load	500 lbs.	2,500 lbs.
Breaking Load	2,000 lbs.	10,000 lbs.
Flash over Voltage (dry)	20,000 A.C.	30,000 A.C.
Flash over Voltage (wet)	2,000 A.C.	10,000 A.C.

BRITISH INSULATED & HELSBY CABLES

LIMITED

CABLEMAKERS & ELECTRICAL ENGINEERS

PRESCOT, LANCASHIRE, and HELSBY, nr. WARRINGTON

Home Branches in : London, Manchester, Glasgow, Birmingham, Newcastle, Cardiff, Dublin, Belfast, and Leeds.

Overseas Branches in : Melbourne, Johannesburg, and Calcutta.

Agencies in : Amsterdam, Bombay, Buenos Ayres, Christiania, Hong Kong, Rangoon, Shanghai, Singapore, and Lisbon.

5

Digitized by Google

YOU WILL FIND

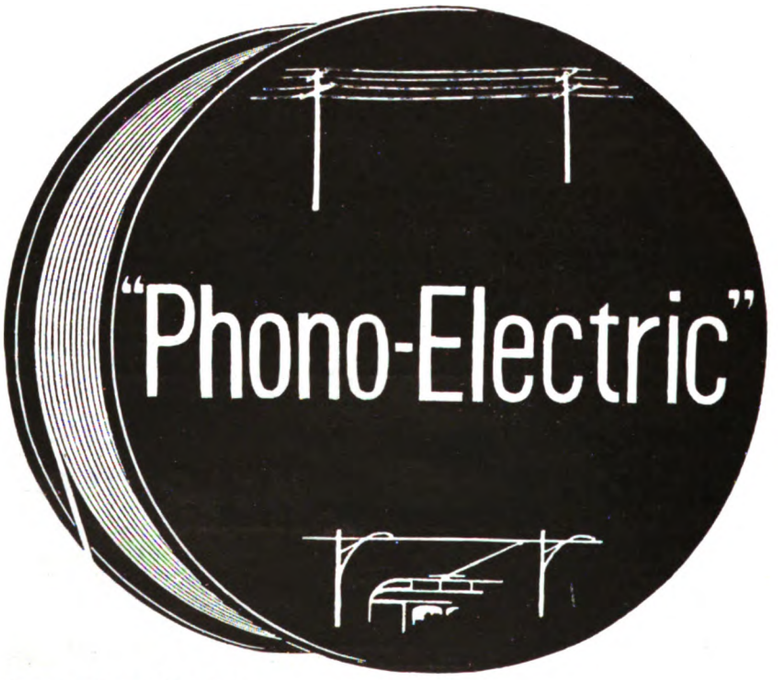
PHONO-ELECTRIC
Trolley Wire

USED WHEREVER SERVICE CONDITIONS ARE EXACTING AND ECONOMY IS AIMED AT

ALL OVER THE WORLD

THOUSANDS OF MILES IN USE

LASTS 2½ to 3 TIMES AS LONG AS HARD DRAWN COPPER



THOUSANDS OF MILES NOW IN USE

Manufactured by the Bridgeport Brass Company.

THE EQUIPMENT & ENGINEERING CO.

2 & 3 Norfolk Street, Strand

LONDON W.C.2

And at NEW YORK

Telephone City 1088 (2 lines)

Telegrams Kharparts, Estrand, London

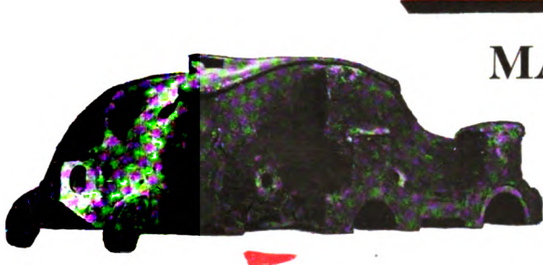
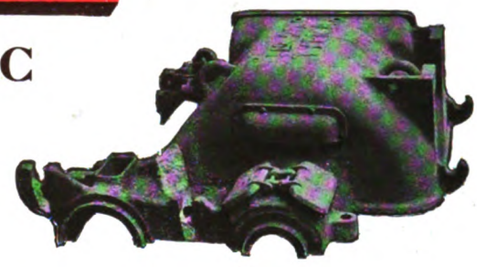
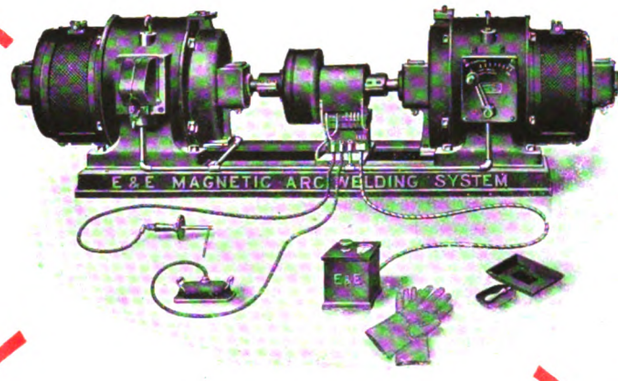
Digitized by Google

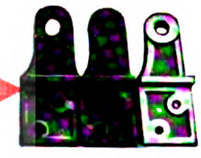
ELECTRIC ARC WELDING

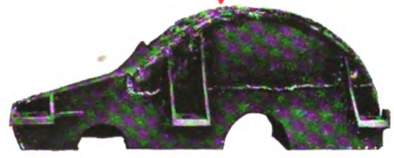
THE E&E

MAGNETIC ARC SYSTEM

TYPICAL REPAIRS
OF INTEREST TO
TRAMWAY ENGINEERS





Write us To-day for Full Particulars

THE EQUIPMENT & ENGINEERING CO.

Works
HOLLOWAY N.

2 & 3 Norfolk Street, Strand, LONDON W.C.2
and at NEW YORK

Telegrams
Kharparts, Estrand, London
Telephone
City 1088 (2 lines)

Digitized by Google

Combined

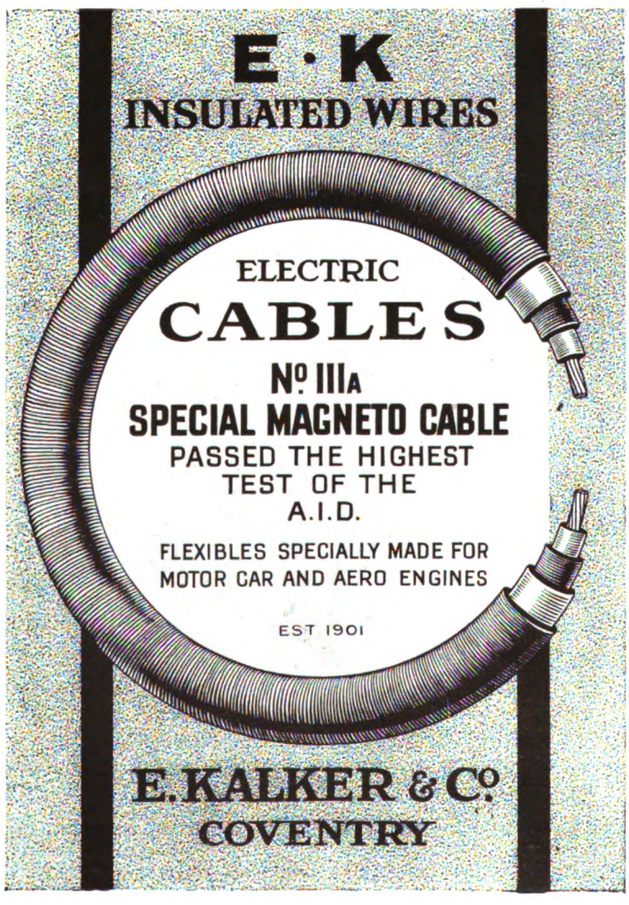
Surface and Tube Railway Electrification

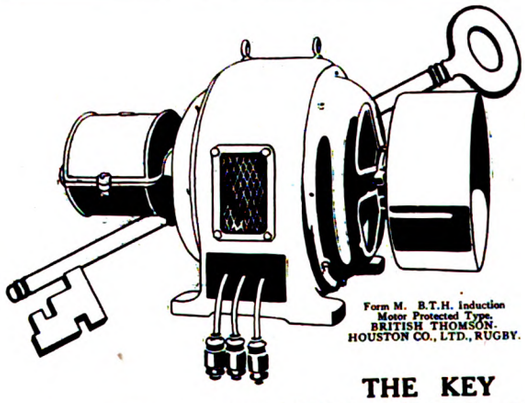
Bakerloo Train leaving Watford.
London & North Western Railway.

Central London Railway train, showing motor car at end, used on Bakerloo-Watford Extension.

Complete electrical equipments consisting of interpole electric motors, automatic control, motor-driven air compressors, etc., supplied and installed for the London Electric Railway Company, Limited, on the Bakerloo-Watford combined surface and tube line by

THE BRITISH THOMSON-HOUSTON CO. LTD.
ELECTRICAL ENGINEERS AND MANUFACTURERS
Head Office and Works——————RUGBY, ENGLAND





Form M. B.T.H. Induction Motor Protected Type. BRITISH THOMSON-HOUSTON CO., LTD., RUGBY.

THE STANDARD

Standard insulating specialties are regularly used by the leading electrical manufacturing firms, lighting and power stations, railways, tramways, etc., which constitutes definite proof of their practical utility.

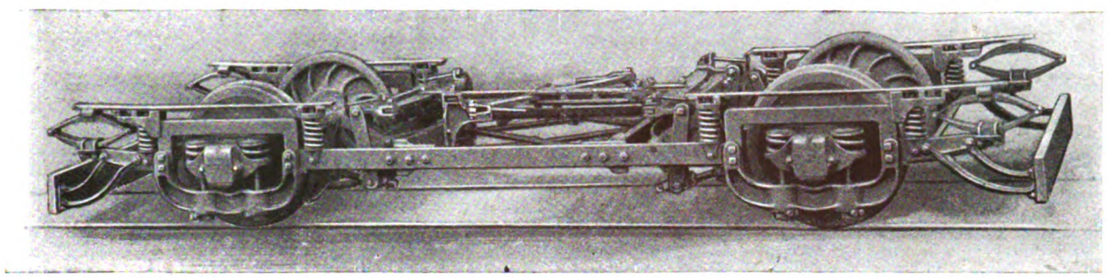
THE KEY TO THE WHOLE MATTER

of good insulation is to periodically coat the armatures and windings of your electrical plant with Standard Insulating Varnishes and Compounds and so lock out the possibility of breakdown through the penetration of oils, moisture, acid and dirt. Don't experiment with inferior varnishes. "Just as good" does not spell efficiency. Standard Varnishes and Compounds are unequalled.

Catalogue, and Expert advice where necessary from:—
PINCHIN, JOHNSON & CO., LTD.,
MINERVA HOUSE, BEVIS MARKS, LONDON, E.C.3.

Standard Insulating Varnishes & Compounds

Digitized by Google

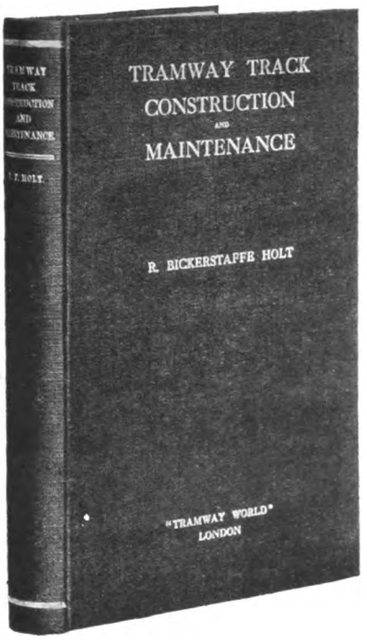


Brill "Radiax" Truck.

NO sub-truck. This in itself distinguishes the Brill "Radiax" from other Radial Axle Trucks. At one stroke we dispose of the dead weight and complication of a sub-truck to carry the motor and brake gear. In the Brill "Radiax" the motor casing is utilised to connect the axle to the motor suspension, which is bolted to the transverse member swinging on a king bolt. In this way we secure simplicity and fewer number of working parts. Another outstanding feature of the design is the very simple method in which we attain return of the axles to parallel after leaving a curve. On straight track, the truck frame is resting on the two pins at the base of each swing-link mounted in the yokes. On a curve, the angle of the link causes the frame to bear on one pin. The superimposed car body weight is thus resting on one pin, and an immediate and powerful tendency is set up due to this weight to return the other pin to its groove. Thus the body weight is acting as an automatic factor in securing car stability. This simple, but effective device, permits a free radial movement, and at the same time preventing any cornerwise swinging of the car body. The brake gear has been given special attention, and is operated from the same transverse swinging member, hence the wheels and axles, the motor, and the brake gear swing or radiate as one unit. This "Radiax" Truck is operating in Great Britain with the greatest success. Details gladly sent.

The J. G. BRILL COMPANY, 110, Cannon Street, LONDON, E.C.4

Digitized by Google



250 pages, 10 × 6½ × 1 in., with over 150 illustrations—Price 10s. 6d.

TRAMWAY TRACK CONSTRUCTION AND MAINTENANCE

BY

R. BICKERSTAFFE HOLT,

HIGHWAYS AND PERMANENT WAY ENGINEER, CITY OF LEEDS;
MEMBER INSTITUTION OF MECHANICAL ENGINEERS;
MEMBER INSTITUTION OF CIVIL ENGINEERS, IRELAND;
MEMBER INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS;
MEMBER MUNICIPAL TRAMWAYS ASSOCIATION;
FELLOW PERMANENT WAY INSTITUTION.

CONTENTS.

FOREWORD.
"What's wrong with the Track?"

CHAPTER I.—CONCRETE FOUNDATIONS.
Defects—Causes of fracture—Method of laying concrete.

CHAPTER II.—CONCRETE MATERIALS.
Road metal—Water gravel—Sand—Clinker sand—Trass.

CHAPTER III.—REPAIRS TO CONCRETE FOUNDATIONS.
Patching—Partial repairs—Complete renewal.

CHAPTER IV.—TRACK DESIGN.
"Follow my leader" policy—Importance of local conditions—Effect on sub-soil—Standard methods—Transverse sleeper tracks—Effect of vehicular traffic and tramway car traffic.

CHAPTER V.—RAIL PACKING.
Pitch and tar packing—Materials—Testing and preparation of materials—Prepared tar—Pitch mixtures—Movement of rails—Packing and floating.

CHAPTER VI.—RAIL LAYING.
Bad rail packing—Rails canted or twisted—Anchoring and padding—Rail expansion and contraction—Curving of rails—Springing of rails—Anchoring new tracks.

CHAPTER VII.—JOINTS, FISH PLATES, BOLTS AND NUTS.
Why joints fail—Dished or hammered joints—Movement at joints.

CHAPTER VIII.—JOINT WELDING.
Methods of welding—Thermit welding—Electric arc welding process—Expansion and contraction—Oxy-acetylene process.

CHAPTER IX.—RAIL WEAR.
At joints—On new tracks—On steep gradients—On wheel tires—Contact of wheel and tire—Leeds special rail section—Railway rails—Depression of check.

CHAPTER X.—COMPOSITION AND MANUFACTURE OF TRAMWAY RAILS AND RAIL WEAR.
Defective rails—Composition of rails—Standard specification—Basic and acid Bessemer process—Sandberg process—Analysis of rails and rail tests—Drop test unnecessary.

CHAPTER XI.—CORROSION OF TRAMWAY RAILS.
Causes of rail corrosion—Exposure to sea water—Effect of corrosive liquid.

CHAPTER XII.—TRACK PAVING.
Effect of vehicular traffic—Cause of loose rails—Importance of quality in sets—Square-dressed setts—Nidged granite setts—Bonawe granite setts—Wood paving—Bedding of setts—Laying and ramming.

CHAPTER XIII.—RECONSTRUCTION.
Removal of tracks—Temporary tracks.

CHAPTER XIV.—SURFACE DRAINAGE AND RAIL MAINTENANCE.
Rail cleaning—Rail grinding—Rail planing.

CHAPTER XV.—SPECIAL TRACK WORK.
Design and standardisation of points—Unbroken main line crossings — Renewable plates — Switches — Mechanism for movable points—Heel pins—Tongue heel adjusters—Guard rails—Spiral tables for curves and junctions—Special track problems.

To all engaged upon track construction, and even to those concerned in road engineering, we can strongly recommend this work.—*The Surveyor.*

This volume is bound to be of the greatest possible value to permanent way engineers.—*The Glasgow Herald.*

It is a thoroughly practical book. Mr. Holt has confined himself to really important matters, and has written on them with the authority that comes of practical scientific experience.—*Yorkshire Post.*

TRAMWAY AND RAILWAY WORLD OFFICES,
AMBERLEY HOUSE, NORFOLK STREET, LONDON, W.C.2

Digitized by Google

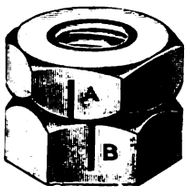
VISLOK

The Reliable Safety Lock Nut

IS NOT A

SPECULATIVE RISK

VISLOK IS Reliable

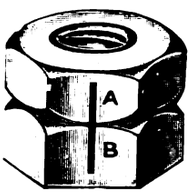


LOCKED

VISLOK IS A Certainty

Guarantees Absolute Security

VISLOK DEFIES Vibration

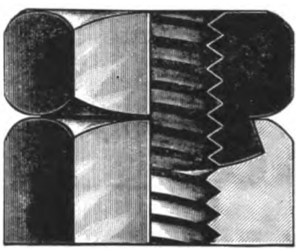


UNLOCKED

VISLOK CANNOT Slack Back

Guarantees Certainty and Stability

VISLOK IS Economical


SECTIONAL VIEW

VISLOK CAN BE Repeatedly Re-Used

SELF-CONTAINED UNIT—NO LOOSE PARTS

VISLOK adapts itself to any Bolt.
VISLOK does not injure the Bolt.

Free Samples with "Nutology" pamphlet, proving how and why VISLOK DEFIES VIBRATION, will be sent post free by

VISLOK Ltd., 3, St. Bride's House, London, E.C. 4.

Prepared by HADDON ADVERTISING AGENCY.—V. 108

A SELECTED LIST

of Tramways where the need of VISLOK has been proved

CORPORATIONS:—Portsmouth; Blackpool; Colne; Wigtonshire; Sheffield; Argyllshire; Croydon; Norwich; South Shields; Ipswich; Burnley; Oldham; Bath, &c.

COMPANIES:—London United; Blackpool, St. Annes and Lytham; Rhondda; Gosport and Fareham; British Electrical Federation; Falkirk and District; Nottinghamshire and Derbyshire, &c.

IT IS YOUR NEED ALSO.

Digitized by Google

ROLLING STOCK SPECIALITIES

BRITAIN
EXPECTS
BRITISH
BUYERS
TO BUY
BRITISH
GOODS

OUR RATTAN

(NATURAL, GLAZE, DULL FINISH, OR COLOURED)

in twill, straight, or fancy weaves,
canvas backed or unbacked, is

BRITISH MADE THROUGHOUT

from the splitting of the cane to the finished article

We hold **LARGE STOCKS OF RAW MATERIALS** and can

GUARANTEE PROMPT DELIVERIES

Particulars of other **BRITISH SPECIALITIES** *upon application*

THE GENERAL SEATING COMPANY LTD.

13 CITY ROAD, LONDON E.C.1

Digitized by Google

J. W. COURTENAY Ltd.

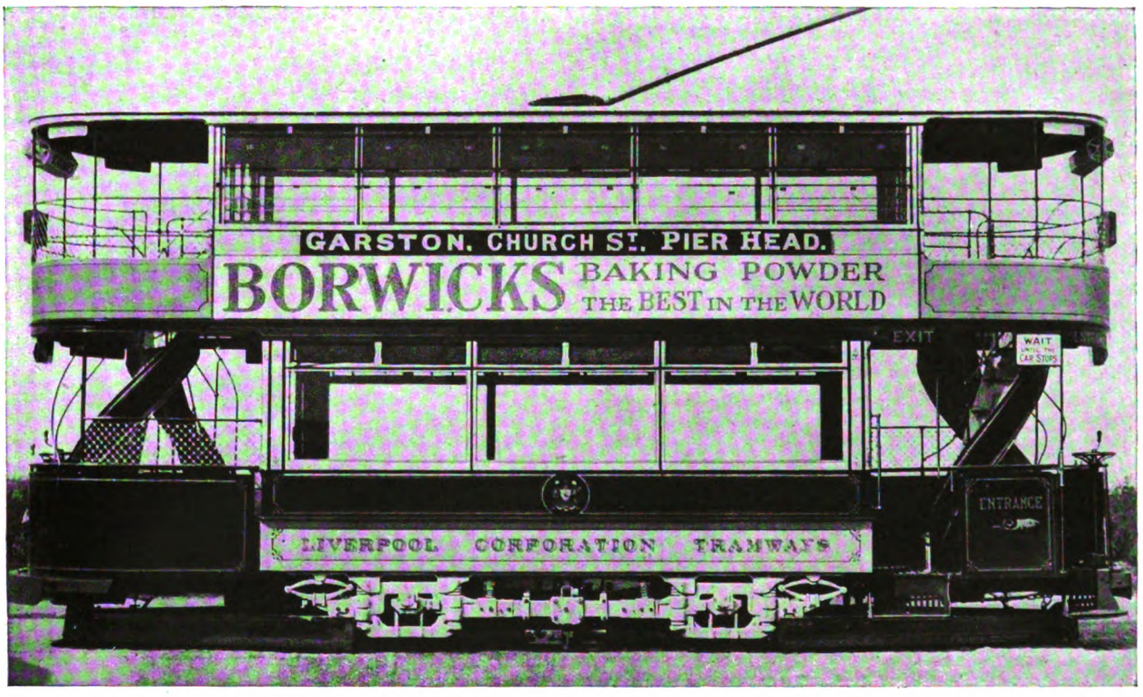
Tramway and Omnibus Advertising Contractors

Offices

LONDON	*Amberley House, Norfolk Street W.C.2*	**BIRMINGHAM**	*147 Corporation Street.*
EDINBURGH	*34 St. Andrew Square.*	**LEEDS**	*Standard Assurance Buildings,*
LIVERPOOL	*Princes Buildings, 81 Dale Street.*	**NEWCASTLE-on-TYNE**	*50 Grey Street. [City Square.*

SOLE CONTRACTORS FOR

Liverpool Corporation Tramways.
Edinburgh & District Tramways Company, Ltd.
Belfast City Tramways.
Leeds City Tramways.
Birmingham Corporation Tramways.
Leicester Corporation Tramways.
Nottingham Corporation Tramways.
Portsdown & Horndean Light Railway Co.
Wakefield & District Light Railway.
Londonderry Tramways Company.
Calcutta Tramways Co., Ltd.
Cawnpore Electric Tramways.
Delhi Electric Tramways.
Mandalay Electric Tramways.
Dover Corporation Tramways.
Newcastle-on-Tyne Corporation Tramways.
Cork Electric Tramways and Lighting Co., Ltd.
Isle of Thanet Electric Tramways Company, Ltd.
Keighley Corporation Tramways.
Keighley Corporation Motor 'Buses.
Burton-on-Trent Corporation Tramways.
Scarborough Electric Tramways Co., Ltd.
Aberdeen Suburban Tramways Co.
Paisley & District Tramways Co.
Hastings & District Electric Tramways Co., Ltd.
Gosport and Fareham Tramways Co.
Doncaster Corporation Tramways.
Cardiff Corporation Tramways.
Plymouth Tramways.
Gloucester Corporation Light Railways.
Ilkeston Corporation Tramways.
Stockport Corporation Tramways.
Ilford Council Tramways.
Aberdeen Corporation Tramways.
Bradford Corporation Tramways.
Southampton Corporation Tramways.
Halifax Corporation Tramways.
Perth Corporation Tramways.
Malta Tramways Company.
Coventry Corporation Tramways.



HIGHEST RENTS PAID FOR SOLE RIGHTS OF ADVERTISING

ON ANY SYSTEM OF TRAMWAYS OR OMNIBUSES

J. W. COURTENAY LTD. are sole agents in the United Kingdom for advertising rights on the tramcars in most of the towns in the following countries, viz.—

FRANCE, ITALY, SWITZERLAND, GREECE, AND EGYPT

6

Digitized by Google

IMPORTANT NOTICE

To Tramway Managers & Engineers

ALSO

Mechanical and Electrical Engineers

We are now able to resume our normal work and invite your enquiries for

Tramway and Railway Axles (Forgings only or Finished)
Steel Tyres (Rough or Finished)
Gears and Pinions (Finished)
Drop Forgings (for All Purposes)

We also specialise in the following

- Chilled Wheels
- Wheel Centres
- Pressed Steel Gear Cases
- Steel Rails
- Fish Plates
- Points and Crossings
- Truck Spares of all Types
- Brake Chains
- Brake Handles
- Armstrong Oilers
- Tramway Springs of all kinds
- Journal Box Fittings
- Safety Treads and Ordinary Steps Treads for Tramcars
- Lifting Jacks
- Corrugation Removers
- Portable Grinding Machines
- Life Guards
- Trolley Heads
- Overhead Material of all kinds
- Trolley Wire, Round or Grooved
- Armature and Suspension Bearings
- Commutators
- Armature & Field Coils
- Copper Bonds
- Destination Screens and Destination Indicators
- Rino Gear Lubricants
- Guard Wire & Strain Wire
- Insulated Wires and Cables, Association & Non-Association
- Rattan for all purposes
- Blinds and Curtains
- Tramcar Steps
- White Metal for Bearings
- Malleable & Cast Iron for all purposes
- Non-Wearable and Silent Brake Shoe Hangers
- Reversible Tramway Seats
- Extended Spring Base Axle Box
- Illuminated Destination Signs
- Double-Acting Two-Flow Sanding Devices

The Anger Improved Automatic Brake Adjusters
For Single and Bogie Trucks

Rail Grinders, Corrugation Removers, and various Tramway Supplies and Equipment

The Anger Manufacturing & Supply Company, Limited

Registered Offices
BANK CHAMBERS
FISHERGATE, PRESTON
ENGLAND

Representatives—London, Glasgow, New York, Montreal, Cairo, Wellington, Buenos Ayres, Melbourne, Johannesburg, Capetown, Bombay, Calcutta, Tokyo, Osaka, Shanghai, and Milan.

Telegraphic Address—"Brakjuster, Preston."

Telephone 1033 Preston.

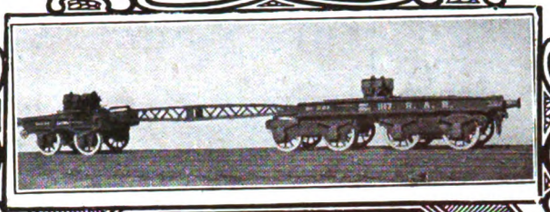
Digitized by Google

Telegrams
"NELSON" MOTHERWELL

London Office
14 LEADENHALL ST. EC

Glasgow Office
40 WEST NILE ST

Cardiff Office
GORDON CHAMBERS
31 QUEEN STREET



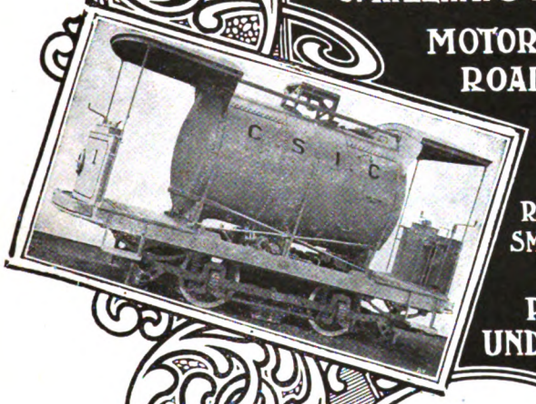
HURST NELSON & Co. Ltd

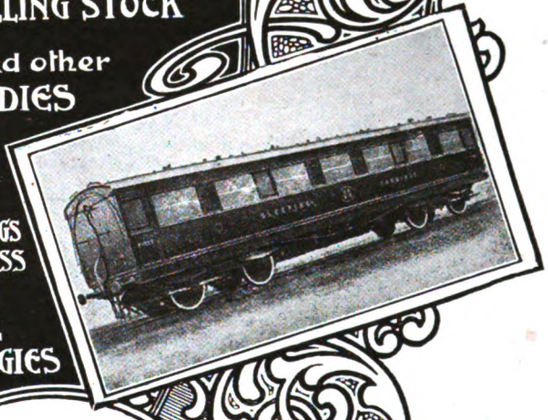
REGISTERED OFFICE & CHIEF WORKS
THE GLASGOW ROLLING STOCK & PLANT WORKS

MOTHERWELL
SCOTLAND.

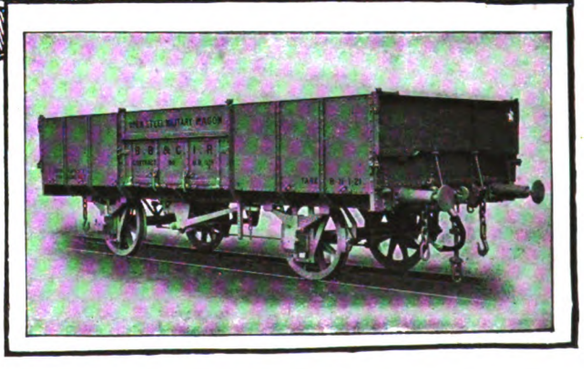
Builders of
RAILWAY CARRIAGES · WAGONS · ELECTRIC CARS
and every other description
of RAILWAY & TRAMWAY ROLLING STOCK

MOTOR OMNIBUS and other
ROAD VEHICLE BODIES





MAKERS OF
WHEELS & AXLES
RAILWAY PLANT · FORGINGS
SMITH WORK · IRON & BRASS
CASTINGS
PRESSED STEEL
UNDERFRAMES & BOGIES



Digitized by Google

EMB EMB

We are now in a position to supply

Gears and Pinions

to any specification

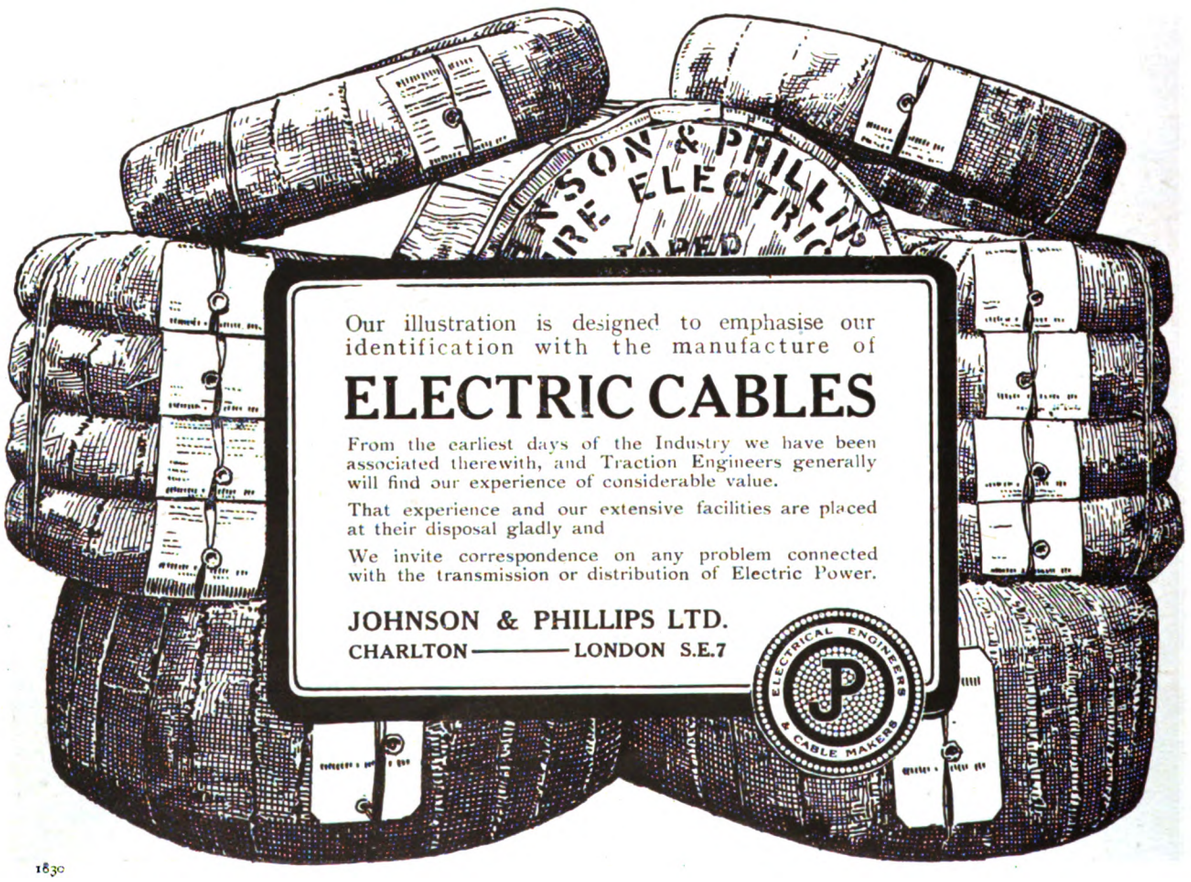
We believe we possess one of the largest and most up-to-date plants in the country devoted to the production of Tramway Gears and Pinions

The Electro Mechanical Brake Company Ltd.

West Bromwich, England Tel.—291-292 W.B. Tele.—Brakes W.B. Established 1908

Scotland - - - - A. F. STEVENSON, 47 Waterloo Street, Glasgow
Newcastle-on-Tyne F. H. MORLEY, Star Buildings, Northumberland Street ('Phone Cent. 1923)
Leeds - - - - - R. HASTE CARR, Crown Point Road ('Phone Cent. 24821)
Australia - - - - J. G. GILBERT LODGE, 109 Pitt Street, Sydney

EMB EMB

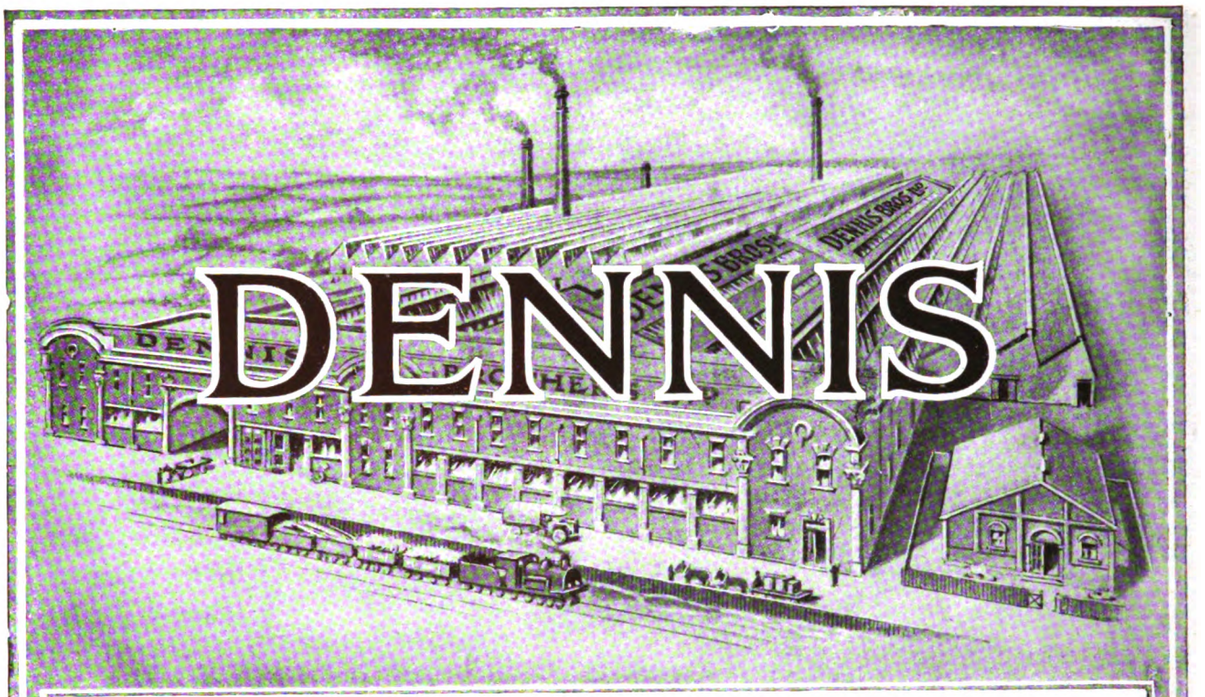

Our illustration is designed to emphasise our identification with the manufacture of
ELECTRIC CABLES
From the earliest days of the Industry we have been associated therewith, and Traction Engineers generally will find our experience of considerable value.
That experience and our extensive facilities are placed at their disposal gladly and
We invite correspondence on any problem connected with the transmission or distribution of Electric Power.
JOHNSON & PHILLIPS LTD.
CHARLTON——LONDON S.E.7
ELECTRICAL ENGINEERS & CABLE MAKERS

1830

Digitized by Google

TILLING-STEVENS
PEACE
The roar of the guns gives place to the clash of hammers. Reconstruction takes up the task and road transport becomes again a vital question to industry.
In Peace as in War the name Tilling-Stevens stands for reliability, economy and strength. The same signal service given to the State is available now for the Community.
Builders of British Motor Vehicles for Manufacturers and Municipalities, commercial motors, omnibuses, char-a-bancs, tower wagons for tramways, motor fire escapes, and mobile arc-welding equipments.
SEND NOW FOR PARTICULARS OF OUR PEACE-DELIVERY PROGRAMME
TILLING-STEVENS LTD
MAIDSTONE
TRANSPORTEN BRIDGE
GARAGE
B-5901
WIDNES CORPORATION
TILLING-STEVENS
MAIDSTONE

Digitized by Google



SPECIAL
ANNOUNCEMENT

TO BREWERS, MILLERS
HAULAGE CONTRACTORS &c.

Owing to cessation of hostilities we are now in a position to offer Quick Delivery
OF

THE DENNIS
3-4 TON "A" TYPE SUBSIDY LORRY

THOUSANDS HAVE BEEN
SUPPLIED
TO THE WAR OFFICE

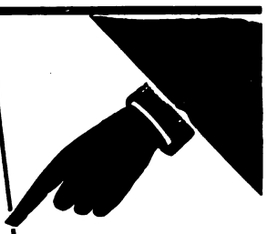
Write for Catalogue and full particulars as to our Rotation Method controlling delivery.

Phone · GUILDFORD 575 (4 LINES)
Wires · DENNIS GUILDFORD

DENNIS BROS LTD
GUILDFORD

Digitized by Google

OUR INVITATION



To Members of The Tramway & Railway World and All Users of Solid Rubber Band Tyres—

You are Invited to Write Now for Copies of our New LIST 103, LINE SKETCHES showing Actual Sizes of Sections, Information re GUARANTEE, LOAD SCHEDULES, DISCOUNTS, 300 FITTERS, &c. Please state Tyre Sizes Used, and Number of Road Motors on Solid Rubber Tyres, and DETAILED QUOTATION will be sent at once.

Dec. 1918

R.S.V.P. to address below

Extract from Pages 3 and 4 of List 103—

SPENCER-MOULTON 60 Solid Rubber Band Tyres

FOR WHEELS OF BRITISH STANDARD SIZES

Tyre Section. m/m	To Fit Rim. diam.	Code.	Price per Single Tyre including Steel Band. £ s. d.	Larger Sections which fit same rim. m/m
75	for 720	Solcoat	5 14 6	85, 90, 100
,,	,, 741	Solbuta	5 18 0	120 only
85	,, 720	Solzam	6 17 6	90, 100, 110, 120
90	,, 670	Solmen	6 14 0	100, 110, 120
,,	,, 720	Solmeat	7 1 0	,, ,, ,,
,,	,, 771	Solning	7 9 0	,, ,, ,,
100	,, 670	Solicur	7 10 6	110, 120, 140, 160
,,	,, 720	Solwell	7 19 0	110, 120, 140
,,	,, 771	Solmart	8 8 6	110, 120, 140, 160
,,	,, 850	Solsmall	9 3 6	110, 120, 130, 140, 160, 180
,,	,, 881	Soliato	9 11 6	120, 130
110	,, 670	Soltant	8 8 6	120, 140, 160
,,	,, 720	Solvamos	8 17 0	,, ,, ,,
,,	,, 771	Solcere	9 8 6	,, ,, ,,
,,	,, 850	Solruner	10 3 0	120, 130, 140, 160, 180
120	,, 670	Solenza	9 6 6	140, 160
,,	,, 720	Solpop	9 16 6	140, 160, 180
,,	,, 741	Solcida	10 1 6	——
,,	,, 771	Solgest	10 8 0	140, 160
,,	,, 850	Solsize	11 6 0	130, 140, 160, 180
,,	,, 881	Solsoro	11 12 6	130, 140
130	,, 850	Solbiga	12 13 0	140, 160, 180
,,	,, 881	Solbicer	13 1 0	,, ,, ,,
140	,, 670	Solpen	11 16 0	160
,,	,, 720	Solcer	12 7 6	160, 180
,,	,, 771	Solcerton	13 10 0	160
,,	,, 850	Solyres	14 5 0	160, 180
,,	,, 881	Solforbig	15 1 6	160
160	,, 670	Solmol	16 4 0	——
,,	,, 720	Solal	17 2 0	180
,,	,, 771	Solider	18 2 0	——
,,	,, 850	Solbrit	19 13 0	180
,,	,, 881	Solex	20 5 0	——
180	,, 720	Solaston	21 17 0	——
,,	,, 850	Solcarlot	25 1 0	——

For Load Carrying Capacity see Schedules on Page 2 of List.

FOR WHEELS OF OTHER THAN BRITISH STANDARD SIZES

Tyre Section. m/m	To fit Rim. Diam.	Code.	Price per Single Tyre including Steel Band. £ s. d.
90	for 687	Solibla	6 17 6
100	,, 620	Solbath	7 7 6
,,	,, 701	Soltett	7 15 6
,,	,, 751	Solnine	8 5 6
120	,, 660	Soldifer	9 2 6
,,	,, 700	Solwar	9 15 0
,,	,, 789	Solceby	10 13 0
140	,, 681	Solpento	12 0 6
,,	,, 868	Solenco	14 16 6
160	,, 871	Soltish	20 3 0

FOR WHEELS OF AMERICAN SIZES

Rim Fit. in.	in.	Code.	£ s. d.
34 × 3	for 28	Solamix	6 0 6
36 × 3	,, 30	Solamcat	6 7 0
32 × 3½	,, 26	Solampres	6 10 0
34 × 3½	,, 28	Solamour	6 13 6
36 × 3½	,, 30	Solamdoz	7 0 0
38 × 3½	,, 32	Solamsang	7 11 0
36 × 4	,, 30	Solambird	8 8 0
36 × 5	,, 30	Solamer	10 2 0
40 × 5	,, 34	Solamlet	11 0 0
36 × 6	,, 30	Solamkan	11 14 0
40 × 6	,, 34	Solrica	12 15 6
42 × 7	,, 36	Solcan	16 6 0

OTHER SIZES AND PRICES ON REQUEST.

TROLLEY TRUCK TYRES

(STANDARD SIZES)

in.	in.	in.	in.	Rim Fit. in.	Code.	Price. £ s. d.
10	× 3	× 6½	= 3	for 6½	Soltrolone	2 11 6
16	× 3½	× 12⅛	= 3½	,, 12⅛	Soltrolto	3 18 3
20	× 3½	× 16	= 3½	,, 16	Soltroltree	4 13 0
22½	× 3½	× 17¾	= 3½	,, 17¾	Soltrolfor	5 0 0
27½	× 3½	× 23½	= 3½	,, 23½	Soltrolsang	6 2 0

(NON-STANDARD SIZES.)

16	× 3	× 12⅛	= 3	for 12⅛	Soltrolsix	3 15 0
20	× 3	× 16	= 3	,, 16	Soltrolset	4 9 0
15	× 3½	× 11¼	= 3½	,, 11¼	Soltrolocto	3 18 3
15	× 3⅛	× 12	= 3⅛	,, 12	Soltrolnine	

19 × 3, 19 × 3½, 24 × 3, 24 × 3½, 24 × 3½, &c., on request.

GEORGE SPENCER, MOULTON & CO. LTD.

Telegrams— "SOLSPEN, MANCHESTER" Head Office Solid Tyre Department—239 Deansgate, MANCHESTER Telephones— 5180-1 City

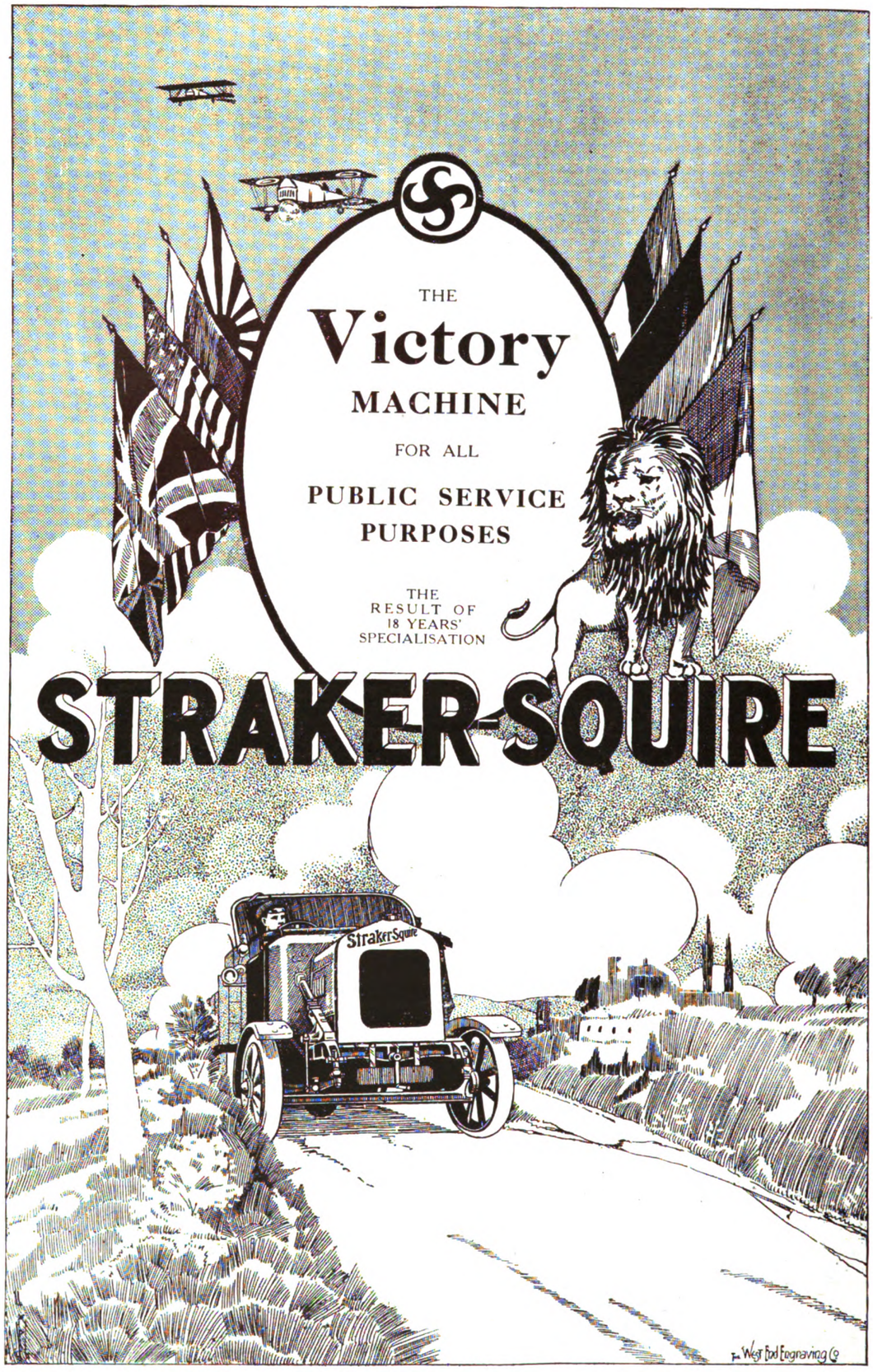
Works—Kingston Mills, Bradford-on-Avon Registered Offices—77-79 Cannon Street, London E.C.

DEPOTS AND DISTRICT SUPPLIERS—

LONDON—15-21 Spenser Street, Westminster S.W.1; GLASGOW—65-67 Bothwell Street; LEEDS—68 Albion Street; BRADFORD—Parry Lane, Bowling (Eric S. Myers); BRISTOL—Haslam & Stretton Ltd., Bristol Bridge; CARLISLE—14a Botchergate (County Garage Co.); DUBLIN—184 Great Brunswick Street (C. E. Jacob); NOTTINGHAM—Trent Street (A. R. Atkey & Co. Ltd.); DERBY—Beckett Street (A. R. Atkey & Co. Ltd.); HUDDERSFIELD—4 St. John's Road and East Parade (Atkinson & Co.); LLANDRINDOD WELLS—Tom Norton Ltd., Automobile Palace; CARDIFF—11 Windsor Place (Haslam & Stretton, Ltd.); BIRMINGHAM—John Buckingham, Ltd., 332/3, Bradford Street; NEWCASTLE-ON-TYNE—Pottery Lane (Forth Engine and Motor Co.)

Spencer-Moulton Pneumatic Tyres are World-Famous for Light Delivery Vans and Other Motor Cars.

Digitized by Google



STRAKER-SQUIRE LTD. LONDON S.E.1

Digitized by Google

SHREWSBURY-CHALLINER

SOLID TYRES FITTED FREE

AT OUR DEPOTS IN

MANCHESTER
LONDON
BIRMINGHAM
BRISTOL
LEEDS
GLASGOW AND
DUBLIN

The above Depots are equipped with Special Plant to facilitate Quick Renewals

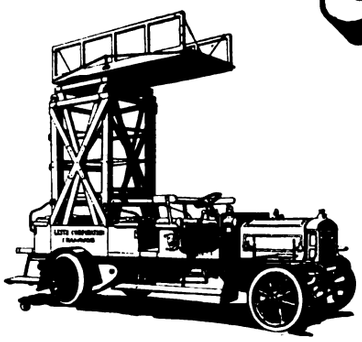
Solid Tyres for Corporation ROAD SWEEPERS A SPECIALITY

THE
SHREWSBURY S.T. CHALLINER TYRE CO.
LIMITED

815

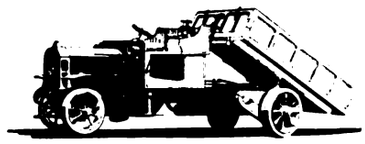
Digitized by Google

Halley



CAPACITIES

2 TONS TO 6 TONS



THE ABNORMAL USAGE UNDER WAR CONDITIONS HAS PROVIDED EXPERIENCE NO OTHER SERVICE COULD HAVE GIVEN. OUR PEACE-TIME VEHICLES WILL CONTAIN MANY VALUABLE IMPROVEMENTS ON PRE-WAR MODELS, BASED ON THE EXPERIENCE GAINED

HALLEY'S INDUSTRIAL MOTORS LTD.

YOKER——————GLASGOW

The shortage of labour in your paint room is easily remedied by adopting the Aerograph method of painting and varnishing.

This method not only shows a considerable saving in labour but the work is quicker and a better finish obtained than by the usual brush method.

Write us for an appointment and we shall be pleased to demonstrate this system.

THE **Aerograph Co., Ltd.**
43, HOLBORN VIADUCT, LONDON, E.C.
Telephone 2041, HOLBORN, Telegraphic Address "AEROGRAPH, LONDON"

ALFRED WILLIAMSON

TRAMWAY & RAILWAY TICKET PRINTER,
ASHTON-UNDER-LYNE.

THE 'WILLIAMSON' REGISTERING TICKET BELL PUNCH

TICKETS & Supplied on the **PUNCHES** Very Best Terms.

ESTABLISHED 1836.

Telephone: 320 Ashton-under-Lyne.

THE STRONGEST PUNCH ON THE MARKET.

SAMPLES & PRICES ON APPLICATION.

PUNCHES ON SALE OR HIRE.

Digitized by Google

P.S.V. Ltd

Stevens Petrol-Electric Vehicles

BEFORE DECIDING ON YOUR POST-WAR MODEL SEND FOR PARTICULARS OF THE STEVENS 3-4 TON PETROL-ELECTRIC CHASSIS WHICH HAS RENDERED SUCH YEOMAN SERVICE WITH THE BRITISH EXPEDITIONARY FORCE.

ENQUIRIES ARE INVITED FROM ALL INTERESTED IN THE TRANSPORTATION OF PASSENGERS AND GOODS; ALSO ARC-WELDING, POWER TRANSMISSION, BATTERY CHARGING AND OTHER SERVICES WHERE RELIABILITY IS ESSENTIAL

IMMEDIATE DELIVERY

STEVENS PETROL-ELECTRIC VEHICLES LTD.

(Managing Director, W. A. STEVENS)

82 VICTORIA STREET, LONDON S.W.1

Telegrams
STEMOBILE—SOWEST—LONDON

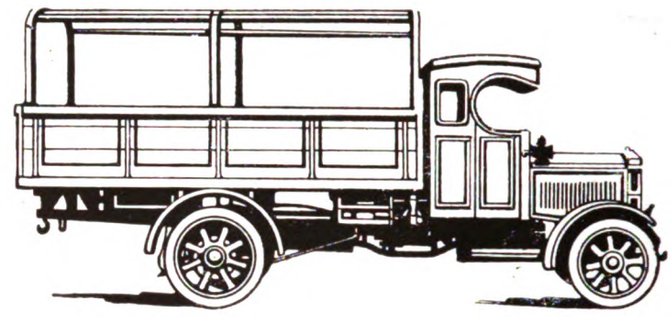
Telephone
VICTORIA 5086

Digitized by Google

Place Your Orders Now for Early Deliveries of the ALL-BRITISH

"KARRIER"
Commercial Motor Vehicles
TRADE MARK

"Quality First and Foremost"



For 3, 4 and 5-ton loads. 50 h.p. Live axle or chain drive. Unequalled for reliability, economy and power

Definite delivery dates can now be given

London Office—68 Victoria Street, S.W.1
Telegrams— "Karriakar" London
Telephone— Victoria 2246

KARRIER WORKS
(Clayton & Co. Hudds. Ltd.)
HUDDERSFIELD, ENGLAND
Sole Proprietors and Manufacturers of "Karrier" Commercial Motor Vehicles

Telegrams— "Karriakar" Huddersfield.
Telephone— Huddersfield 1441, 1442, 1443

WORM DBS DRIVE

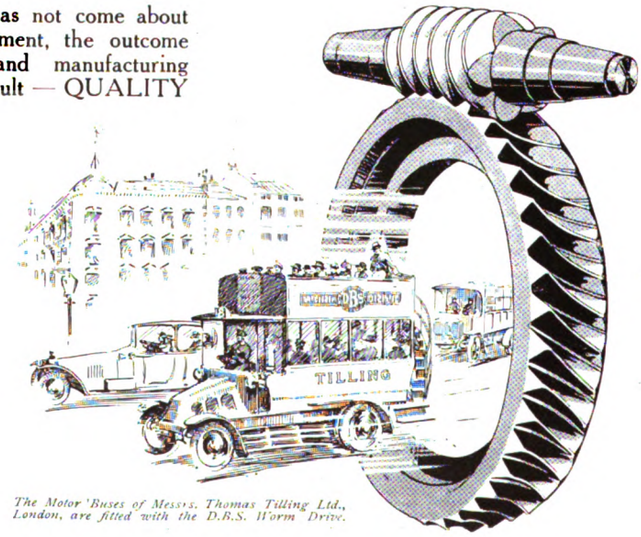
The Drive of Dependable Service

The success of the D.B.S. worm drive has not come about by chance—it has been a steady development, the outcome of painstaking engineering research and manufacturing methods that will only accept one result — QUALITY

Actual experience under the most strenuous conditions on thousands of cars and commercial vehicles of all types has proved beyond dispute the reliability, noiseless operation, and superior efficiency of the D.B.S. worm drive type of power transmission.

The new patent form of tooth and thread of the D.B.S. worm drive gives the maximum amount of rolling contact and reduces the sliding element to the minimum. Equip your cars or heavy vehicles with the D.B.S. worm drive and you assure constant dependability and performance. May we send you full details? Write to Dept. M.

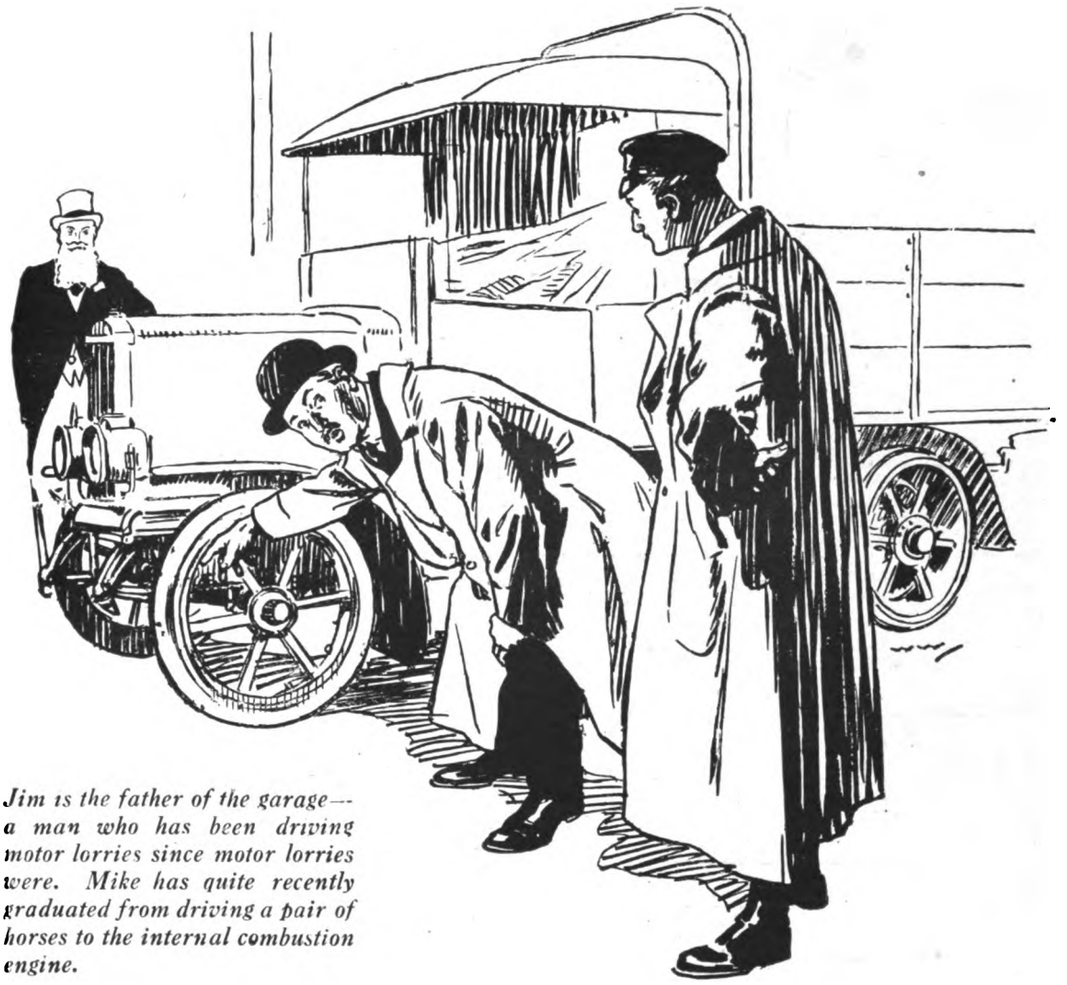
DAVID BROWN & SONS
(HUDDERSFIELD) LTD.
PARK WORKS, LOCKWOOD
HUDDERSFIELD



The Motor 'Buses of Messrs. Thomas Tilling Ltd., London, are fitted with the D.B.S. Worm Drive.

RPC

Digitized by Google



Jim is the father of the garage—a man who has been driving motor lorries since motor lorries were. Mike has quite recently graduated from driving a pair of horses to the internal combustion engine.

OVERHEARD IN THE GARAGE.

"YOU and them 'orses of yours make me pretty near sick, Mike. You're always gassing about the way you kept them and yet you can't keep the tyres on your lorry proper!

Them 'orses of yours never picked a stone up in their 'oofs, I suppose? And you never picked a stone out for 'em, did you? You did, eh! and yet you 'aven't got the sense to run over those Dunlop solid rubber tyres when you brings the lorry in and fetch them bits of sharp flint out, too! A bit of flint can do as much damage to a solid rubber tyre as it can to a 'orse's 'oof!

Use a bit more 'orse sense, Mike, and less 'orse talk!"

DUNLOP RUBBER CO., LTD.,
Founders of the Pneumatic Tyre Industry,
Para Mills, Aston Cross BIRMINGHAM.
DUNLOP SOLID RUBBER TYRE FITTING DEPOTS: Belfast, Birmingham, Bristol, Coventry, Dublin, Glasgow, Leeds, Liverpool, London, Manchester, Newcastle-on-Tyne, Norwich, Nottingham.

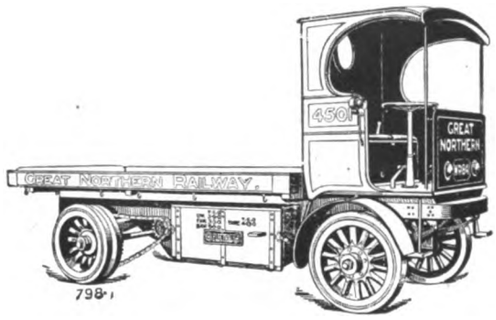
Dunlop solid rubber tyres are obtainable from all leading motor dealers.

Are YOU employing a disabled man?

Digitized by Google

"Ironclad Exide"
(REGISTERED)

THE BATTERY
for
COMMERCIAL ELECTRIC VEHICLES



It is a sufficiently striking testimony to the reliability of the electric vehicle that by far the greatest number of those in use are employed in just those particular classes of work in which it is essential that there shall be no failure in continuity of service.

THE Chloride ELECTRICAL STORAGE COMPANY LIMITED.

Head Office and Works—
CLIFTON JUNCTION, MANCHESTER

London Office—
39 VICTORIA STREET S.W.1.

INSTAL "THE COVENTRY" CHAIN DRIVES AS AN INVESTMENT

The longer life, increased efficiency—a continuous 98%—and improved quality of product, ensure a handsome return for the slight extra initial cost.

Why not consult us on any transmission problems? The solving of these would be a mere matter of routine to our technical staff. Blueprints, estimates, and advice generally given freely and without obligation.

Head Offices and Works—
"THE COVENTRY" CHAIN CO. Ltd.
COVENTRY

Telephone No. 830 Telegrams—"Chains Coventry"

LONDON BIRMINGHAM MANCHESTER DUBLIN

The Shortage of Skilled Drivers

If you engage an inexperienced driver to run your lorry it is not improbable that he will one day throw in his clutch with all the vigour his inexperience prompts—strain the whole of your chassis—and do damage in your gear box that will take days to repair.

Make it impossible for him to do this by having the clutch lined with Ferodo fabric. It will then engage sweetly however violently applied—transmit maximum power from engine to back axle—never slip or seize. Ferodo fabric lasts much longer than leather or any imitations of Ferodo fabric, and will not burn out. It gives infinitely superior service at less cost.

List from

The Herbert Frood Co. Ltd.
Works: Chapel-en-le-Frith

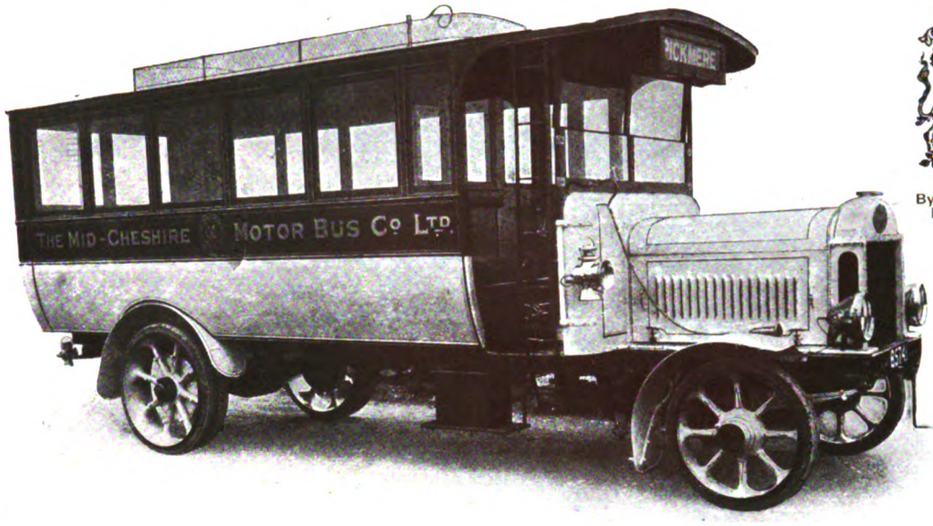
Contractors to the War Office and Admiralty, London General Omnibus Company, and Underground Electric Railways of London and Paris.

Depots at London, Birmingham, Belfast, Bristol, Cardiff, Edinburgh, Glasgow, Liverpool, Manchester, and Newcastle.

FERODO
Friction Surfaces.

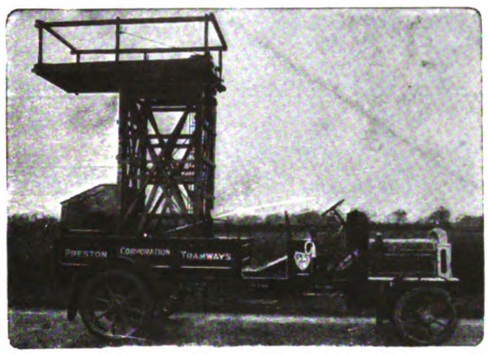
Digitized by Google

"LEYLAND"



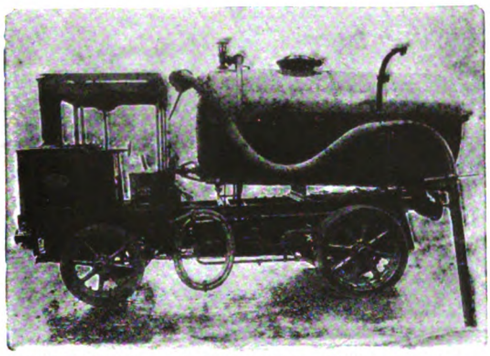
By Appointment to H.M. The King.

"LEYLAND" (STANDARD) SINGLE-DECK 'BUS TO SEAT 32 INSIDE.



STANDARD TOWER WAGON.

PETROL MOTOR, TIPPING ROAD METAL.



STEAM VACUUM TANK WAGON & GULLEY FLUSHER.

MANUFACTURERS OF

Fire Engines,
Fire Tenders,
Municipal Motors of all kinds,
Rail Cars,
Self Propelled Tram Cars,
Tower Wagons,
Petrol Lorries, Vans, Omnibuses, etc.,
and STEAM WAGONS, etc.

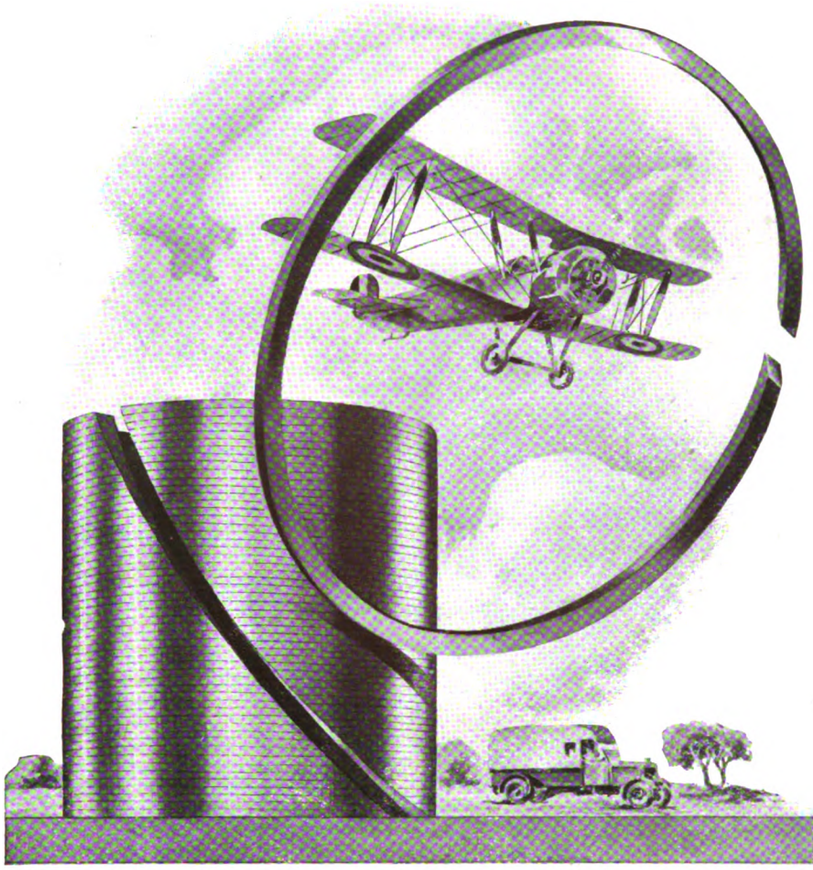
Send for our Latest Catalogue.

London Office: 47, NEW KENT ROAD, S.E.1

LEYLAND MOTORS (1914) LTD.,

LEYLAND, LANCS.

Digitized by Google



Allen
PISTON RINGS

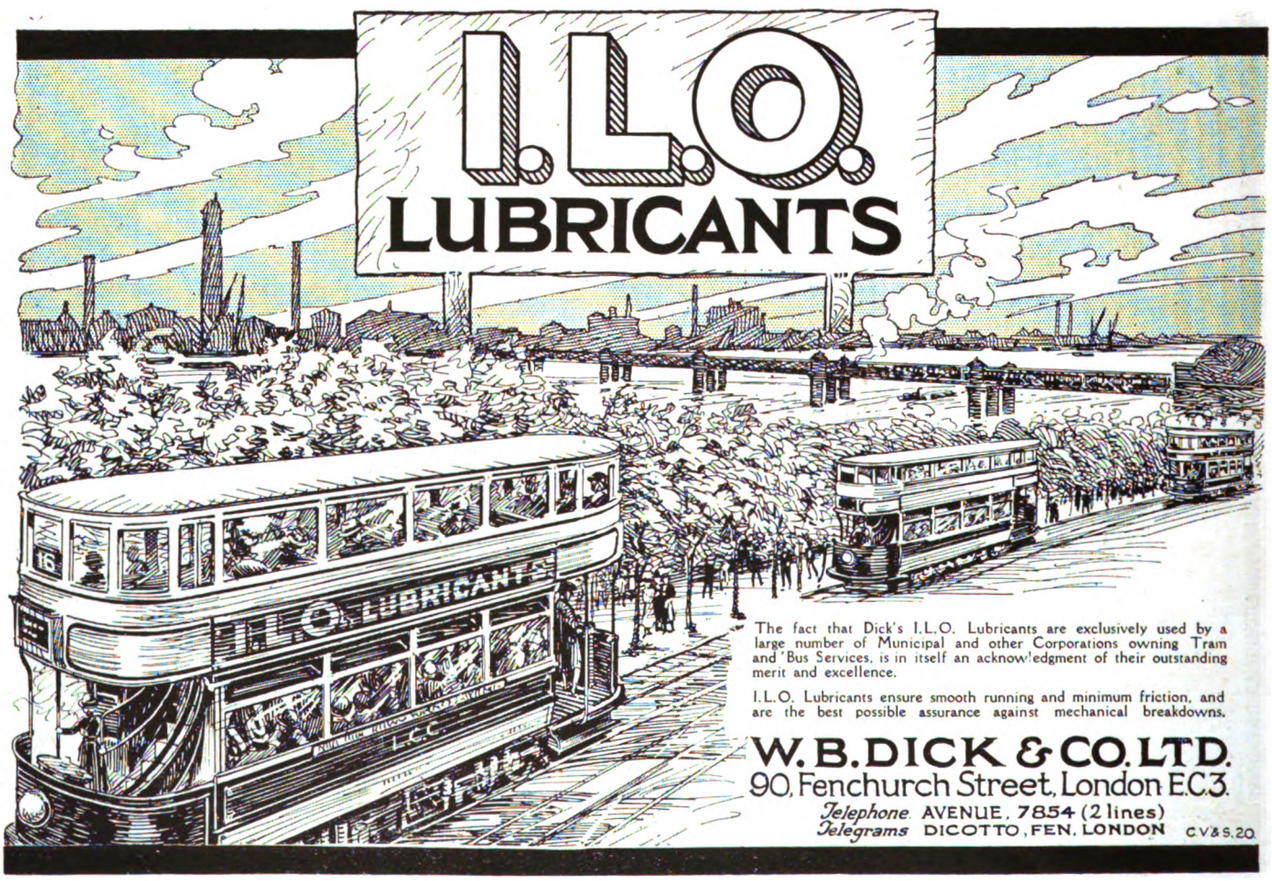
GIVE

Full Power Delivery
Least Frictional Losses
Gas and Oil Tightness

Write for a Sample Ring to

ALLEN & SIMMONDS
LIMITED

Piston and Piston Valve Engineers READING

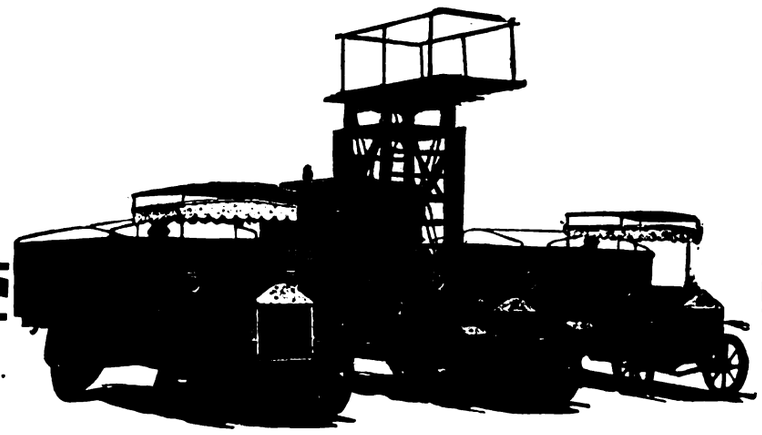


The fact that Dick's I.L.O. Lubricants are exclusively used by a large number of Municipal and other Corporations owning Tram and 'Bus Services, is in itself an acknowledgment of their outstanding merit and excellence.

I.L.O. Lubricants ensure smooth running and minimum friction, and are the best possible assurance against mechanical breakdowns.

W. B. DICK & CO. LTD.
90, Fenchurch Street, London E.C.3.
Telephone AVENUE, 7854 (2 lines)
Telegrams DICOTTO, FEN, LONDON C.V.&S.20

Digitized by Google



Lacre
UTILITY MOTOR VEHICLES

Second To None

in their ready adaptability to the various requirements of

The Tramway and Railway World

Contractors to

H.M. GOVERNMENT
THE ADMIRALTY
THE WAR OFFICE
THE ALLIED FORCES
THE CROWN AGENTS FOR THE COLONIES
COLONIAL AND FOREIGN GOVERNMENTS
CORPORATIONS
MUNICIPALITIES, RAILWAY COMPANIES AND LEADING TRADING HOUSES
THROUGHOUT THE WORLD

Specialists for

TOWER WAGONS . .
INSPECTION WAGONS
REPAIR WAGONS . .
CABLE LAYING WAGONS
OMNIBUSES . . . . .
PARCELS DELIVERY VANS
GOODS LORRIES . . .
of every description, etc., etc.

Lacre
ALL BRITISH UTILITY VEHICLES

For Standard Load Capacities of 10, 15, 25, and 30 cwt., and 1, 2, 3, 4, 5, and 6 tons respectively

THE LACRE MOTOR CAR CO. LTD.

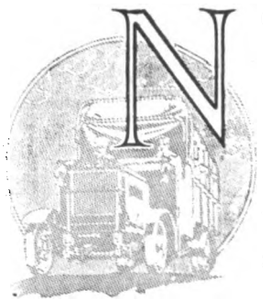
Manufacturers of Every Description of Commercial and Public Service Motor Vehicles

LONDON, LETCHWORTH, MANCHESTER, and GLASGOW

CLAUDE BROWNE - - - Managing Director

Digitized by Google

Sturdiness



NO quality is more characteristic of the

MAUDSLAY

the Industrial Vehicle which is indisputably the Lorry for reliable performances.

Look at its present record—look at its past — and if your activities call for another lorry or a fleet of them—Well, see us first.

THE MAUDSLAY MOTOR CO. LTD.
COVENTRY

1746

a Leading British Rubber Firm —

with over sixty years' reputation has a business proposition to make to a gentleman in close touch with Tramway and Motor Omnibus Companies, Railway Companies, Municipal Corporations, Engineers &c. The firm

REQUIRES A REPRESENTATIVE

for their extensive range of products, which covers—

SOLID TYRES FOR COMMERCIAL VEHICLES, PNEUMATIC TYRES, CARRIAGE TYRING, RUBBER SHEETING, VALVES, PACKING, HOSE, WASHERS, BUFFERS &c. &c.

These goods are extensively advertised and are known throughout the world. Reply in first instance to Box 10521, c/o A. J. Wilson & Co. Ltd., 154 Clerkenwell Rd., London E.C.1.

Ask our Advice

upon the disposal of your Obsolete Ledgers, Account Books, Copy Books, in fact all kinds of

WASTE PAPER

W. V. BOWATER & SONS
LIMITED

Registered Trade Mark

Paper Makers, Wholesale and Export Merchants

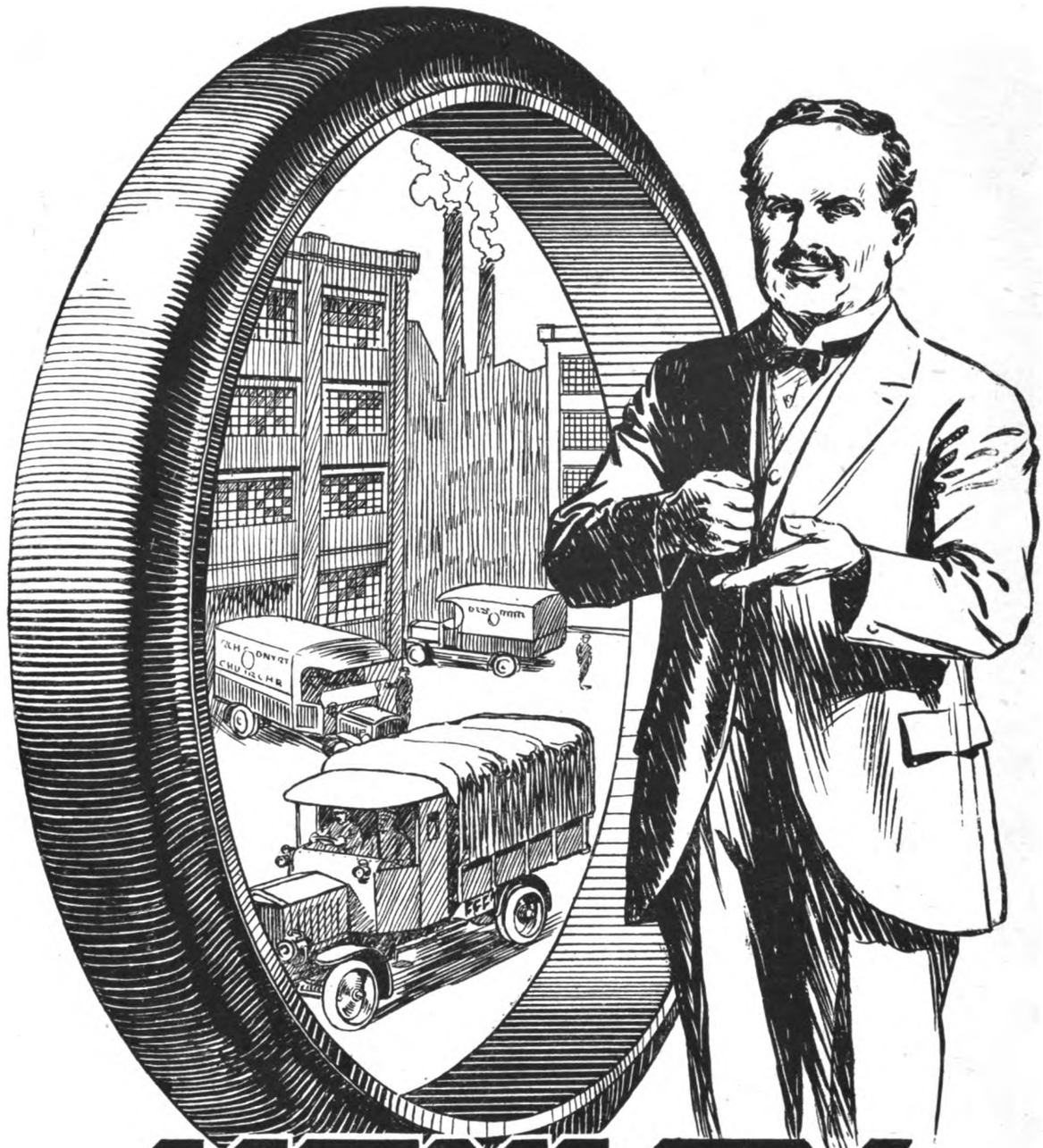
HEAD OFFICE
159 Queen Victoria St.
LONDON E.C.4

The demand for this commodity for Munitions and Paper Making Purposes is Great and Prices High.

We can help you to your decided advantage. Write—

W. V. BOWATER & SONS
Limited
83 Commercial Road, Lambeth
LONDON S.E.1

Digitized by Google



HENLEY

SOLID RUBBER BAND TYRES

Write for Quotations

HENLEY'S TYRE & RUBBER CO. LTD.

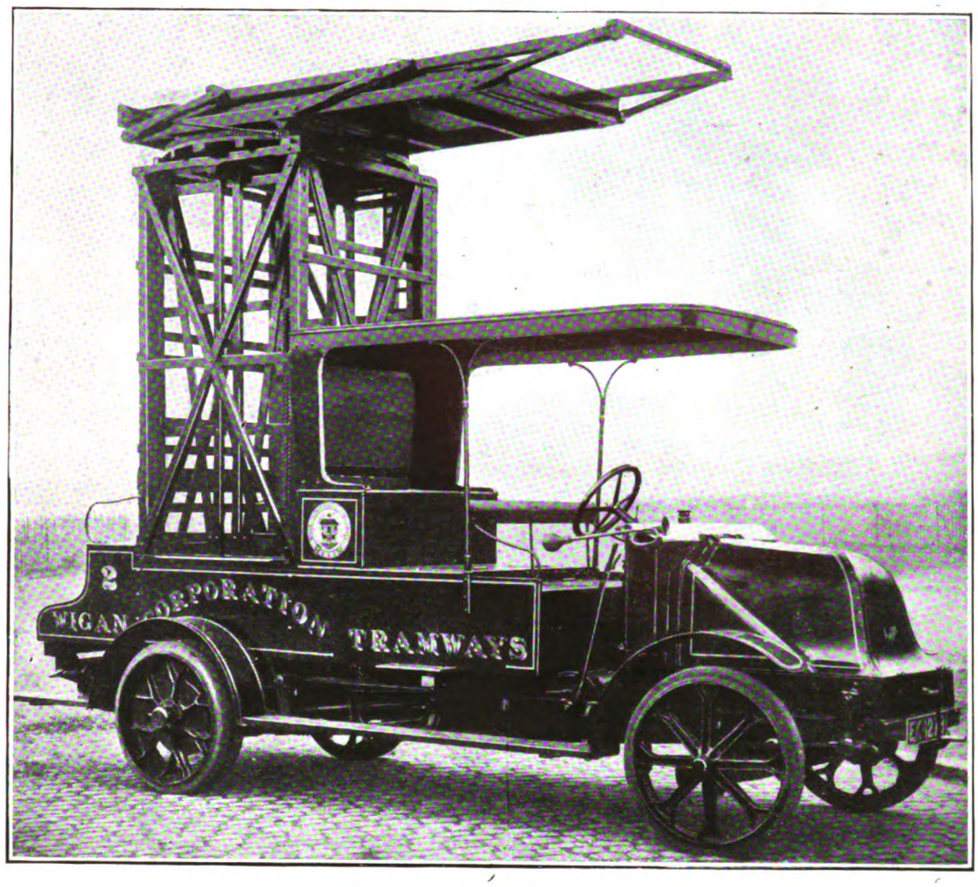
18 New Union Street, Moorfields, LONDON E.C.2

Grams—"Hetewocol, Ave, London" *'Phone—No. 3886 London Wall*

Digitized by Google

NORTH BRITISH CLINCHER BAND TYRE
On Any Road—
In Any Weather
When the full story of the War is told, and credit is meted out where it is due, "CLINCHER" Tyres will receive their full meed of praise. Their reliability, under most adverse conditions, earned the appreciation of Authorities, Officers and Men. When roads and weather combined to do their worst Clinchers did their best—and won. Fit Clincher Tyres on your commercial vehicles, and reap a harvest of long mileage, reduced vibration, petrol economy and efficient service.
"CLINCHER"
Regd. TRADE MARK
TYRES
THE NORTH BRITISH RUBBER CO., LTD.,
Edinburgh, London and Branches.

Digitized by Google



An exceptional opportunity

Austin

For a few weeks private firms have an opportunity of snapping up a few of these splendidly serviceable vehicles for heavy transport. The fact that the Government has released a portion of a contract makes it possible to put forward this offer, and enables us to give

Definite Delivery Dates

WRITE AT ONCE

THE AUSTIN MOTOR CO. LIMITED

Head Office—
Northfield, BIRMINGHAM. 'Phone—King's Norton 230. 'Grams—"Speedily, Northfield."
London—479-483 Oxford St. W.1. 'Phone—Mayfair 6230. 'Grams—"Austinette, Wesdo."
Manchester—130 Deansgate. 'Phone—City 3573. 'Grams—"Austinette."
Norwich—18-22 Prince of Wales Rd. 'Phones—1054 & 1055. 'Grams—"Austinette."
And at PARIS

Digitized by Google

SMITH'S COMMERCIAL ACCESSORIES

Smith's Radiator Cosy

Made of heavy tarpaulin, lined with felt, this is an ideal Cosy for Commercial Vehicles. The front of the Cosy is made to roll up, thereby allowing the Cosy to remain undisturbed on the radiator during the entire winter. When ordering please send pattern and breadth of radiator.

No. **K2** ..... Price **50**/- each.

Smith's Mileage Recorders

Strongly constructed of brass, with internal fittings on the Smith scientific principle this instrument is made to record season mileage of vehicles up to 10,000 miles. **Adas** mileage for all reversings and automatically resets itself to zero.

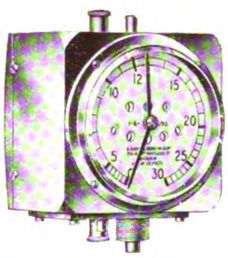
No. **C1.** Price (complete with drive for any make of chassis).....**£5 5s.**

Smith's Bulb Horn

A very serviceable Horn, suitable for all vehicles — of superior make and finish, and fitted with a specially selected reed — can be supplied in either black, service green or brass.

No. **G5301** ..... Price **25**/- each.

Smith's Combined Speedometer and Mileage Recorder



This is the finest possible Recording Instrument made for Commercial Vehicles, and will stand up to its work under any conditions. It makes every conceivable record required for Costing, Checking Petrol Consumption and Tyre Mileage, *viz.*, speed up to 30 miles per hour, maximum speed on any journey, season mileage and daily mileage, and it records accurately whether the vehicle is going backward or forward.

No. **F6.** Price (complete with drive for any make of chassis) **£8 8s.**

Sheppee Non-Skids for Twin Solid Tyres

Messrs. Smiths are Sole London Agents for the Sheppee Non-Skids, which have already achieved a phenomenal success. These Non-Skids consist of strong chains fitted with cross stakes of special type, and are fastened by a patented fastener. Made of extra tough steel, they are indestructible, they never go wrong or get out of order, and they are equally effective on hard ground or soft ground. There is no fear of any damage resulting to the tyres by using Sheppee Non-Skids. Made in three distinct sizes.

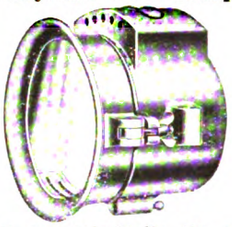
Light Type (for tyres up to 1010 m/m) ..... **£8 10s.**
Medium Type (,, ,, ,, 1050 m/m) ..... **£9 5s.**
Heavy Type (,, ,, ,, 1070 m/m) ..... **£11 0s.**

Smith's Badger Truck Jack

This is the most effective Truck Jack on the market. It is made of the very best materials throughout, and acts on the quick-life principle. The lifting pawls are of carbon drop forged steel, and the reversing mechanism of pressed steel. This Badger Truck Jack is listed to lift three tons weight, but every Jack is actually tested to lift twice its actually listed weight. They are practically unbreakable and give the greatest leverage with the least effort.

List No. **H400.** Price **£3 3s.**

Acetylene Head Lamps



These are undoubtedly the most suitable type of Lamp for commercial use. They are extremely strong, reasonably light, and practically unbreakable. These Lamps are cast in aluminium in one piece. Every detail of their construction has been arranged to withstand the roughest vibration and shocks. Fitted with genuine Mangin mirrors and standard lug centres, 8½ inches.

No. **1300** ..... Size 8 inches. Price **£2 15s.** each.

Acetylene Generators

This is a most serviceable Generator, very much in demand. The container is of cast aluminium and the case of galvanised iron. Like the lamp it is of specially strong construction, designed to withstand heavy vibration.

Type No. **1268.** Price **£3 1s. 6d.** each

Ebonite Garage Hand Lamp

Made throughout of ebonite, this Lamp complies with the Board of Trade regulations. It is absolutely fool-proof, of sound, workmanlike construction, and designed specially for the purpose for which it is required. All who have once used it highly recommend it, and no efficient garage should be without it. It has many distinctive features not possessed by the ordinary garage lamps. Full particulars will be sent to anyone interested on request.

No. **F203** ..... Price **9/6** each.

Write for copy of our Special Catalogue of Commercial Accessories.

S. Smith & Sons
MOTOR ACCESSORIES LTD.
SMITH'S
SPEEDOMETER HOUSE.
179-185, Gt Portland St., London, W.1.
Telephones, Mayfair 6250 (6 lines).
Telegrams "Speedomet, Telew, London."
Midland Service Depot: 122, Alma Street, Birmingham.
Northern Depot: 12, Jackson's Row, Deansgate, Manchester.

The recognised house for Commercial Vehicle Accessories.

Digitized by Google

COMMER CARS

For Goods & Passengers

We invite correspondence from — present and potential users —

Commercial Cars Ltd. Luton

Digitized by Google

CO-ORDINATION

WITH "Unity of Command" has come the great and glorious success on all our Allied fronts, and this co-ordination of the many simultaneous offensives has been vitally essential to victory.

FOR Home, Passenger, or Goods Transport it is almost as important that arrangements should synchronise in like fashion.

THE motor-'bus or lorry scheduled to run in conjunction with tram or train services depends largely on the tyres for its time-keeping, and it is only necessary to state that the leading users have proved that

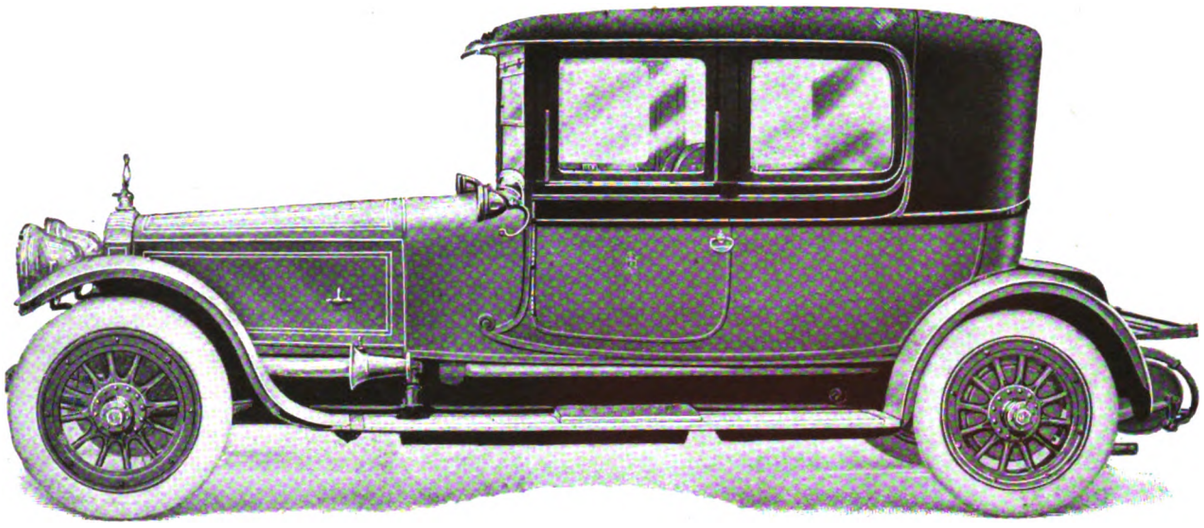
AVON
BAND TYRES

MAKE PUNCTUALITY CERTAIN

19 NEWMAN STREET, OXFORD STREET W.1
WORKS—Melksham and Bradford-on-Avon, Wilts.

BRANCHES—Manchester, Glasgow, Bristol, Newcastle, Birmingham, Nottingham, Aberdeen, Swansea, Dublin, Paris

Digitized by Google



Cole
FOUR-SEATED
Coupé Cabriolet

Originated and Built by
WM. COLE & SONS Ltd.

Builders of all other types of High-grade Coachwork.

235 Hammersmith Road, London W.6
Telephone—Hammersmith 1413 and 1414.

Beauty with Utility. The Cole Four-seated Coupé Cabriolet has been aptly described as "A tangible expression of a rarely-found ideal—Beauty with Utility." Beauty in the sweeping and graceful lines of design—giving handsome appearance from stem to stern. Utility in being an all-purpose carriage—providing interior drive limousine or open touring car as desired.

Appearance. The design of the Cole is a development of the two-seater coupé principle, but retains the latter's compact appearance and light weight.

The Cole Patent Hood. An important and exclusive feature is the Cole Patent Quick-acting Hood. The success of the carriage centred around the problem of an effective method of raising and lowering the hood. Experiments resulted in perfecting the Cole Patent Self-acting Hood. By simple spring action the hood instantly and mechanically lifts or lowers itself into position. The ease of action is such that a child can operate it.

Seating Capacity. Provision is made for the comfortable and easy seating of four passengers (including driver ; two in the rear cushioned seat and two in the front "Pullman type" chairs.

Adaptability. All seating is detachable. This convenience makes luggage-carrying space as occasion requires. Footboards are also removable, allowing full and free inspection of chassis.

For Owner-Drivers and Lady-Drivers. The Cole Coupé is the greatest success ever attained in the motor carriage for owner-drivers and lady-drivers, in that the interior drive affords complete protection to the driver and enables all the passengers to ordinarily participate in conversation. This dual advantage is particularly appreciated when milady takes the wheel.

Upholstery and Appointments. The interior of the car is luxuriously upholstered and cushioned—giving easiest riding comfort and delicious restfulness. General convenience is provided in refined and useful appointments.

The Finished Production. The complete carriage is an incomparable example of the coachbuilder's art—in beauty of design, in excellence of construction, in refinement of appearance, in perfection of finish, and in utility of purpose.

Mounts all makes of Chassis. The body mounts all makes and types of European and American chassis, from 12 h.p. to the highest-powered cars.

ORDER YOUR COLE COUPÉ NOW

Digitized by Google

FODEN

STEAM WAGONS

. . FOR . .

PUBLIC SERVICE

A "FODEN" FLEET ON WAR SERVICE

UNSURPASSED FOR

Low Running Costs

. . AND . .

Reliability

FODENS, LIMITED Elworth Works, SANDBACH CHESHIRE

Digitized by Google

Observation

The great Wellington on a certain famous occasion would have given much to know what was taking place on the other side of the hill. Since then observation has become a highly developed branch of military science, and to-day tactics and strategy depend entirely on it. As in warfare so also in the realms of industry, observation is of vital importance. Industry has its objectives in their own way almost as difficult to capture as any pill boxes or machine gun nests. In the case of the

ALL BRITISH

WOOD-MILNE

SOLID BAND TYRES

all objectives are reported gained, an achievement due solely to an efficient observation service, which simply means a close attention to details, the latest developments of scientific research and to modern conditions and requirements. The magnificent manner in which they have stood up to the abnormal demands of to-day has stamped them "The Sturdy Tyres" for strenuous Service.

WOOD-MILNE, LIMITED
21 Albion Street, Gaythorn, MANCHESTER
Telegrams "Wudmiln, Manchester." Telephone 8774 City (3 lines)

PRESTON LONDON BRISTOL LEEDS
BELFAST BIRMINGHAM GLASGOW DUBLIN

M586

Digitized by Google

THE
BELL PUNCH & PRINTING Co., LTD.

52-58 TABERNACLE STREET, LONDON, E.C.

Telegrams: "Belpunch, London." Telephone: 7531 Central.

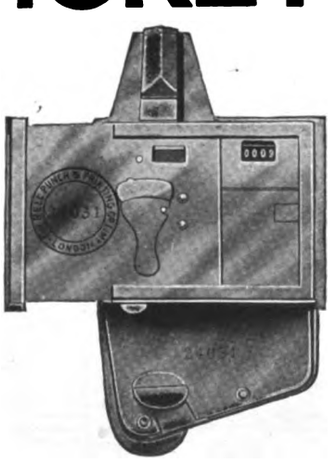
PUNCHES

FOR

OMNIBUSES—TRAMWAYS—RAILWAYS

TICKETS

OMNIBUSES—TRAMWAYS—RAILWAYS



Established 1876.

Enquiries addressed to the SECRETARY, will receive prompt attention.

DOCKERS' SUPERFINE PAINTS

and

EXTRA DURABLE VARNISHES

for

TRAMCARS AND OMNIBUSES.

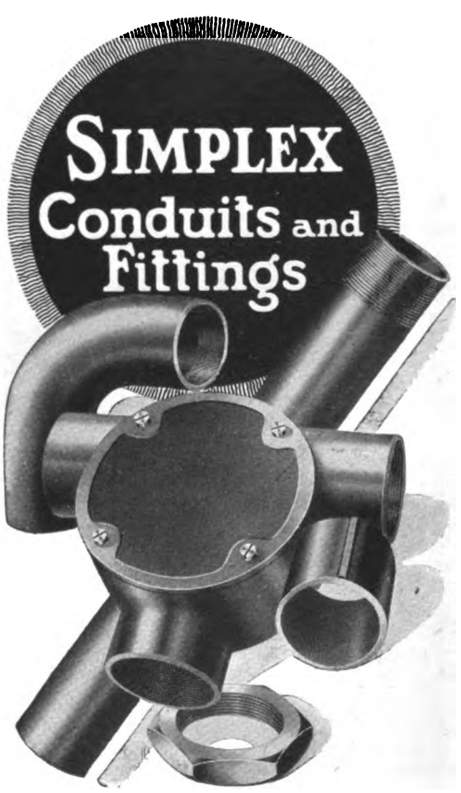
DOCKERS' 'HERMATOR' PAINTS AND ENAMELS

for

POLES & POWER STATIONS.

CATALOGUES AND PATTERN BOOKS FREE ON APPLICATION.

DOCKER BROTHERS Ltd.,
170 Bishopsgate, LONDON, E.C.,
And BIRMINGHAM.



SIMPLEX CONDUITS Limited

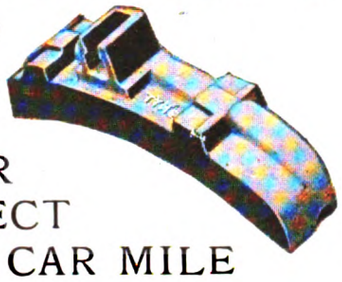
HEAD OFFICE AND WORKS

GARRISON LANE - BIRMINGHAM

Digitized by Google

FOR BRAKE SHOES SPECIFY

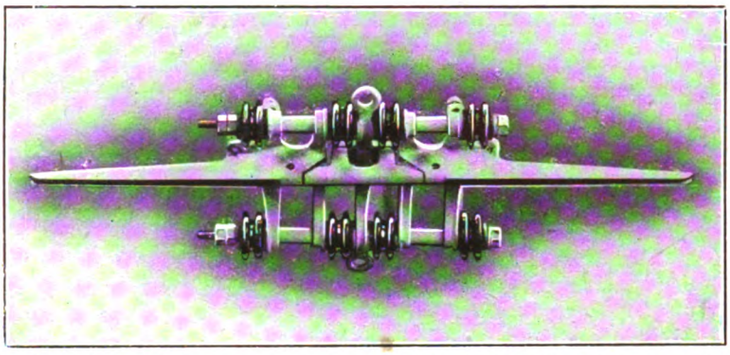
"TYNE METAL"



IT RESISTS HEAVY WEAR
GIVES GOOD BRAKING EFFECT
AND IS GUARANTEED CHEAPEST PER CAR MILE

TYNE METAL CO. Ltd.
HEXHAM-on-TYNE

SECTION INSULATORS

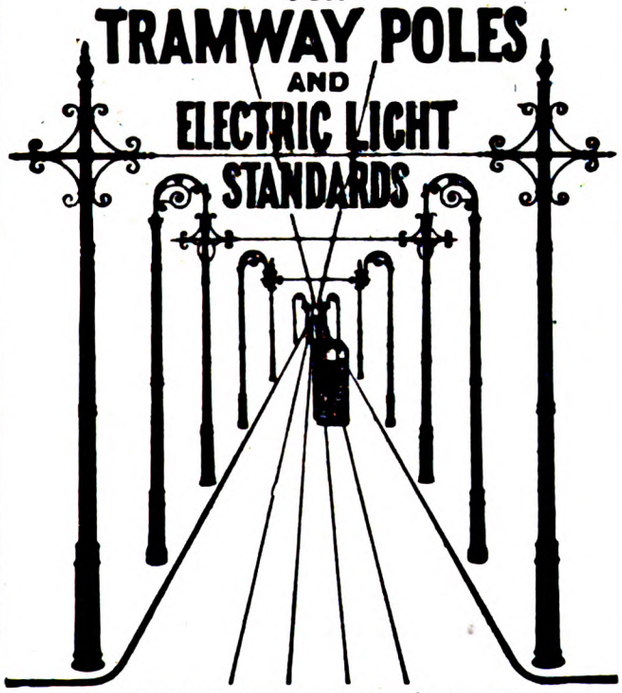


UNEQUALLED FOR
FACILITY
OF
ERECTION
DURABILITY
HIGH
INSULATION
AND
EVEN
RUNNING

Telegrams
"CUFEL, FELTHAM"

G. W. GREEN & CO. (FELTHAM) LTD. Q-FEL WORKS, FELTHAM Middlesex

STEWARTS AND LLOYDS Ltd L&L
FOR
TRAMWAY POLES
AND
ELECTRIC LIGHT
STANDARDS



TELEGRAPH AND TELEPHONE POLES
TRANSMISSION TOWERS
Offices: Oswald St., GLASGOW; Broad St. Chambers, BIRMINGHAM;
Winchester House, Old Broad St., LONDON, E.C.

TELEPHONE: 228, WEST BROMWICH, 2 LINES.

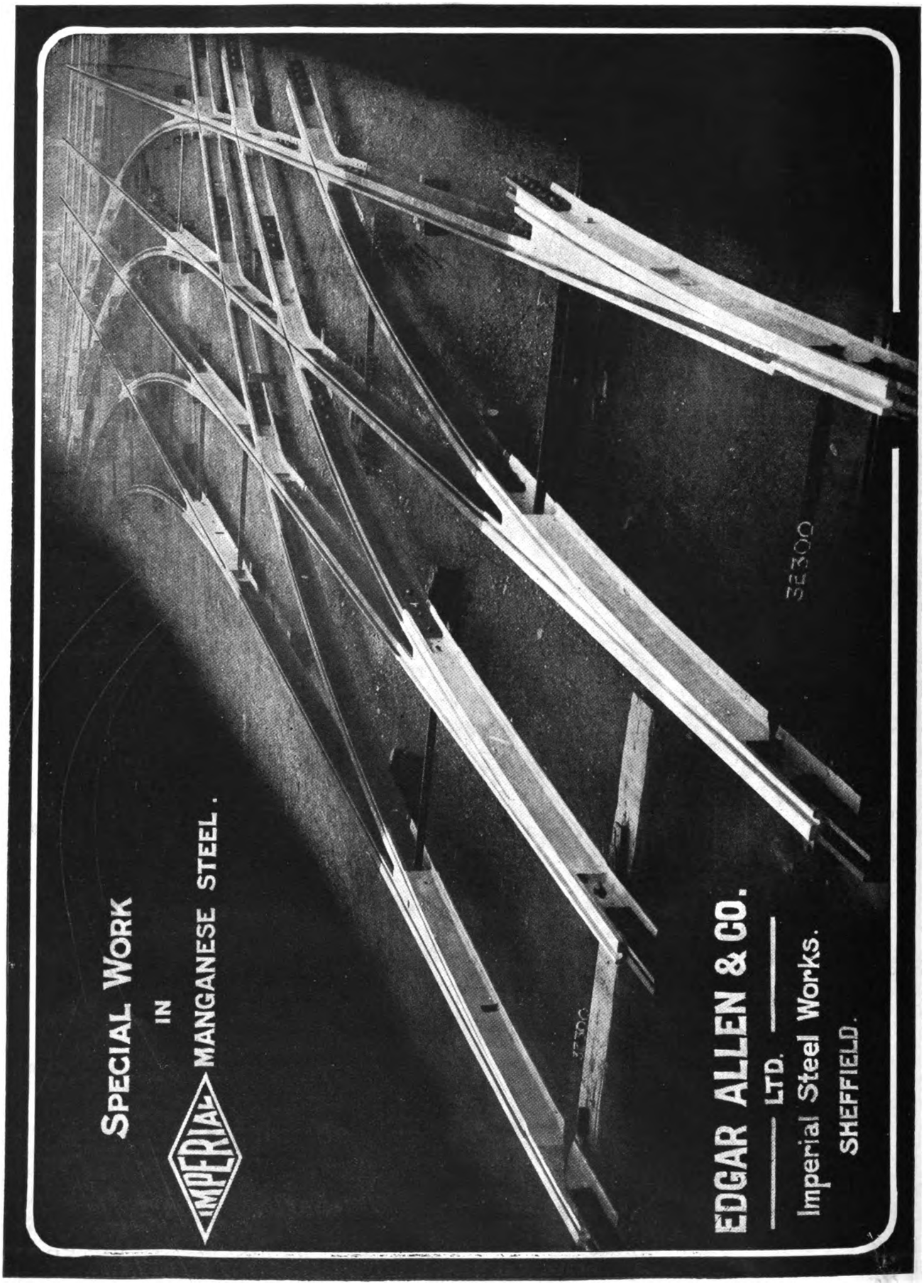
TELEGRAMS: BROCKHOUSE, WEST BROMWICH.

J. BROCKHOUSE & CO. LTD.
West Bromwich,
ENGLAND.

MANUFACTURERS OF
SPRINGS,
FORGINGS,
STAMPINGS,
PRESSED WORK,
BOLTS, Etc.
FOR EVERY DESCRIPTION
OF
ROAD VEHICLES.

YOUR ENQUIRIES SOLICITED.

Digitized by Google



Digitized by Google

CONSERVATION OF TIN.

HOYT ANTI-FRICTION METALS

PERMITTED BY THE

TIN COMMITTEE

*Modified Arrow		(Maximum Quality Permitted)
No. 1		(Intermediate Qualities)
Star		
No. 3M		(Magnolia Quality)

*TIN PERCENTAGE REDUCED TO COMPLY WITH COMMITTEE REGULATIONS. FOR PURPOSES OTHER THAN TRAMWAYS, OUR STANDARD ARROW IS UNCHANGED.

FOR MOTOR OMNIBUSES ATTACHED TO TRAMWAYS, LIMITED QUANTITIES OF HIGHER QUALITY METALS CAN BE SUPPLIED.

The above Metals are Highly Successful in Tramway Service.
Fullest Particulars, Samples, Prices, &c., on Request

THE HOYT METAL CO., LTD.,

(WORKS—MILLWALL E.) 189, HAMMERSMITH ROAD, LONDON, W.6.

"GROVER SPRING WASHER" NUT-LOCK

BEWARE OF ALL CHEAP IMITATIONS
They are like the original in appearance only.

SALES OVER 135,000,000.
Made in all sizes from $\frac{3}{16}$ in. to 4 inches, and in Millimetres.

FOR . . .
FISH BOLTS (Iron or Steel)
ROLLING STOCK,
SIGNAL WORK, &
GENERAL PURPOSES,
ELECTRICAL WORK, &c.

GROVER & Co. Ltd.

Britannia Engineering Works, Carpenters Rd., Stratford, London, E. Telephone
Telegraphic Address: "ADOPTED STRAT LONDON" STRATFORD 984-985.

SIMPLEX LEAD GLAZING

FOR ROOFS, SKYLIGHTS, & HORTICULTURAL WORK.
No Special Contract Required.

NO ZINC, IRON, OR PUTTY USED.

ANY QUANTITY SUPPLIED.

Millions of superficial feet in use on thousands of Structures.

Write for full Illustrations, Testimonials, and Particulars (sent post free).

Are You Satisfied With Your Ticket Service ?

Telegrams "TICKETS, GLASGOW"

If you ask that question of the managers of the largest tramway undertakings, both at home and abroad, the answer will be—

"Yes, we use Glasgow Tickets."

May we send you some specimens? We produce tickets in any style, in any quantity, and print in any language.

Whenever you want tickets, either paper or pulp, we shall be pleased to quote you.

Freedom from ticket worry will be assured if you send your orders to

GLASGOW NUMERICAL TICKET AND CHECK BOOK PRINTING CO. LTD.

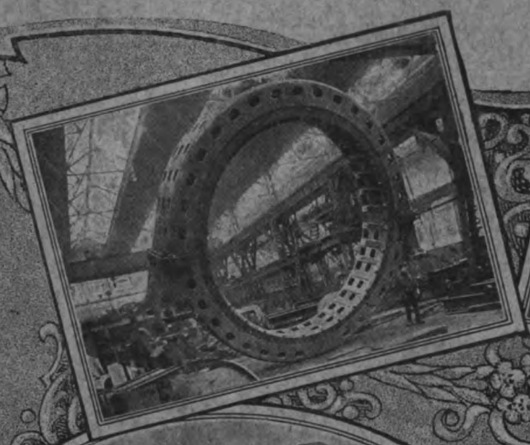
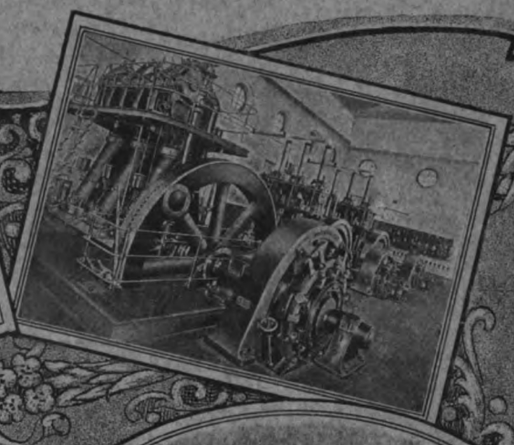
31 FINNIESTON STREET, GLASGOW

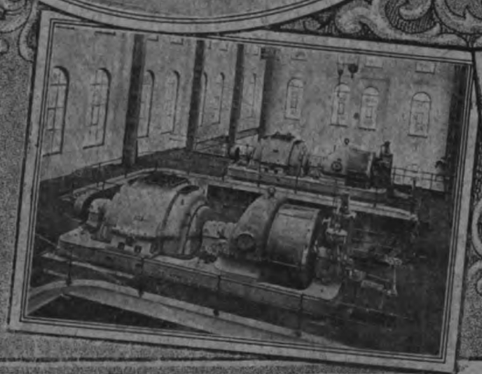
Printed for the Proprietors by Chorley & Pickersgill, Ltd., The Electric Press, Leeds, and Published by the Proprietors at their Offices at Amberley House, Norfolk Street, London, W.C.

Digitized by Google

DICK, KERR & Co., Ltd.

INCORPORATING WILLANS & ROBINSON Ltd. & THE UNITED ELECTRIC CAR Co. Ltd.



MANUFACTURERS OF:—A.C. & D.C. Generators, Motors, Rotary Converters, Steam Turbines, Electric Lamps, Electric Traction Equipments, Diesel Oil Engines, Tramcar Bodies, Locos, &c.,
CONTRACTORS FOR:—The complete construction and Electrification of Railways & Tramways, the equipment of Electric Light & Power Stations, and the construction of Sewage Works & Reservoirs.

Head Office: ABCHURCH YARD, CANNON ST, LONDON, ENGLAND
Branches: Manchester, Newcastle, Tokyo, Sydney, Johannesburg, Buenos Aires, Rio de Janeiro & Milan.

Working in conjunction with:— SIEMENS BROTHERS & Co, Ltd
THE PHŒNIX DYNAMO MFG. Co, Ltd

DICK, KERR | PHŒNIX | SIEMENS

Digitized by Google

Digitized by Google

Digitized by Google

Digitized by Google

THE NEW YORK PUBLIC LIBRARY
REFERENCE DEPARTMENT

This book is under no circumstances to be taken from the Building

FORM 410

Digitized by Google

Digitized by Google

Digitized by Google